DAMOS SUPP. D - MAY 1979

DAMOS

DISPOSAL AREA MONITORING SYSTEM

ANNUAL DATA REPORT - 1978

SUPPLEMENT D

MASSACHUSETTS BAY DISPOSAL SITES

Naval Underwater Systems Center
Newport, Rhode Island

WHOI
DOCUMENT
COLLECTION

New England Division
Corps of Engineers
Waltham, Massachusetts

May 1979

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187
.N45
1978
Suppl. D

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DAMOS

DISPOSAL AREA MONITORING SYSTEM
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SITE REPORT - MASSACHUSETTS BAY SITES

Naval Underwater Systems Center
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New England Division
Corps of Engineers
Waltham, Massachusetts

May 1979

MBL/WHOI
0 0301 0038840 1

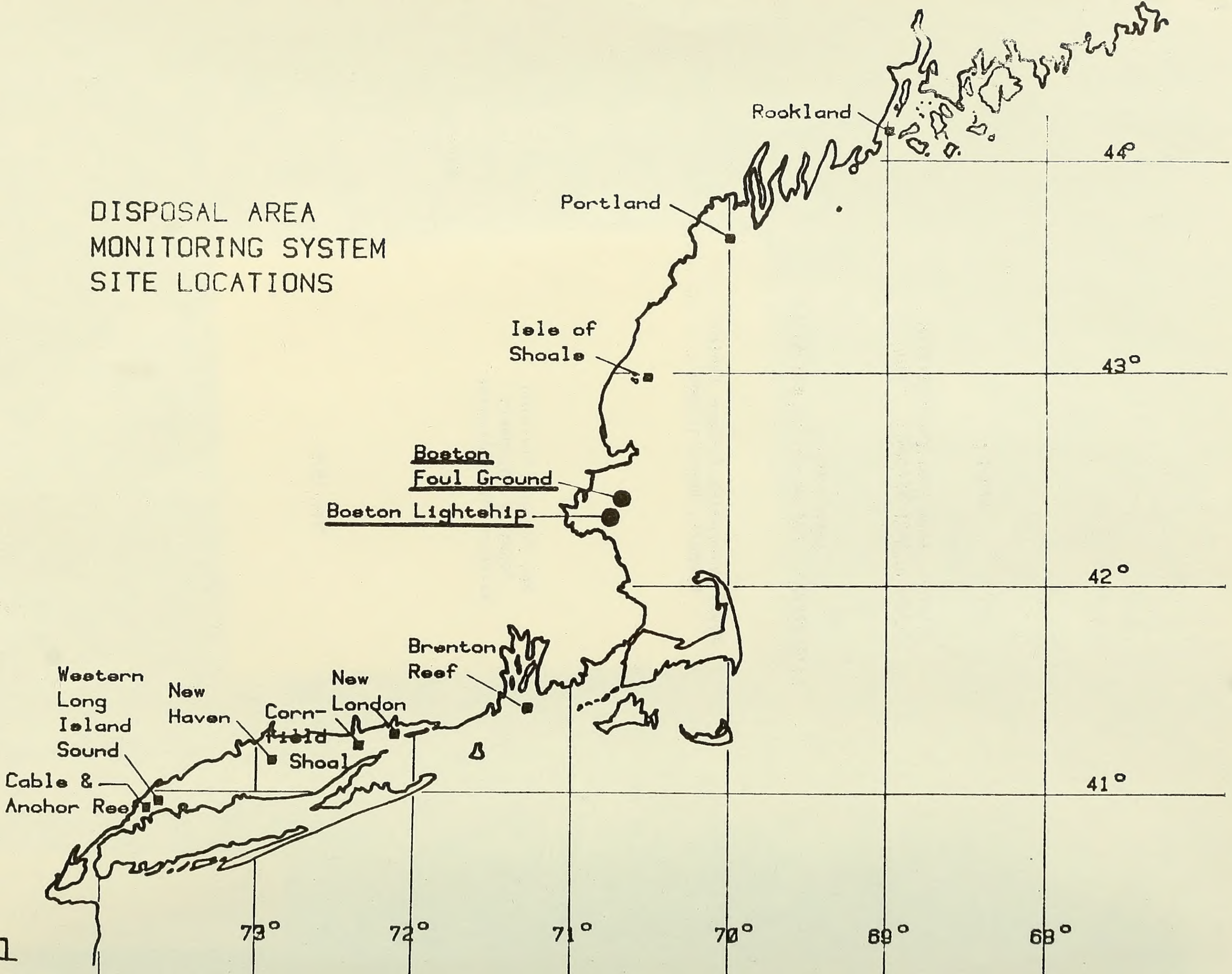

DISPOSAL AREA
MONITORING SYSTEM
SITE LOCATIONS

FIG.-1

DISPOSAL AREA MONITORING SYSTEM

This is one of a series of site specific data reports resulting from the DAMOS program, now two years in progress. DAMOS is the culmination of nearly a decade of prior study efforts, actually preceding NEPA, which have been directed towards the understanding of the effects of and the responsible management of the ocean disposal of dredged materials in New England waters as they fall under the authority of the New England Division of the Corps of Engineers. The individual site reports henceforth will be updated approximately on an annual bases as additional knowledge is gained, at least with respect to those sites where significant disposal activities will have occurred.

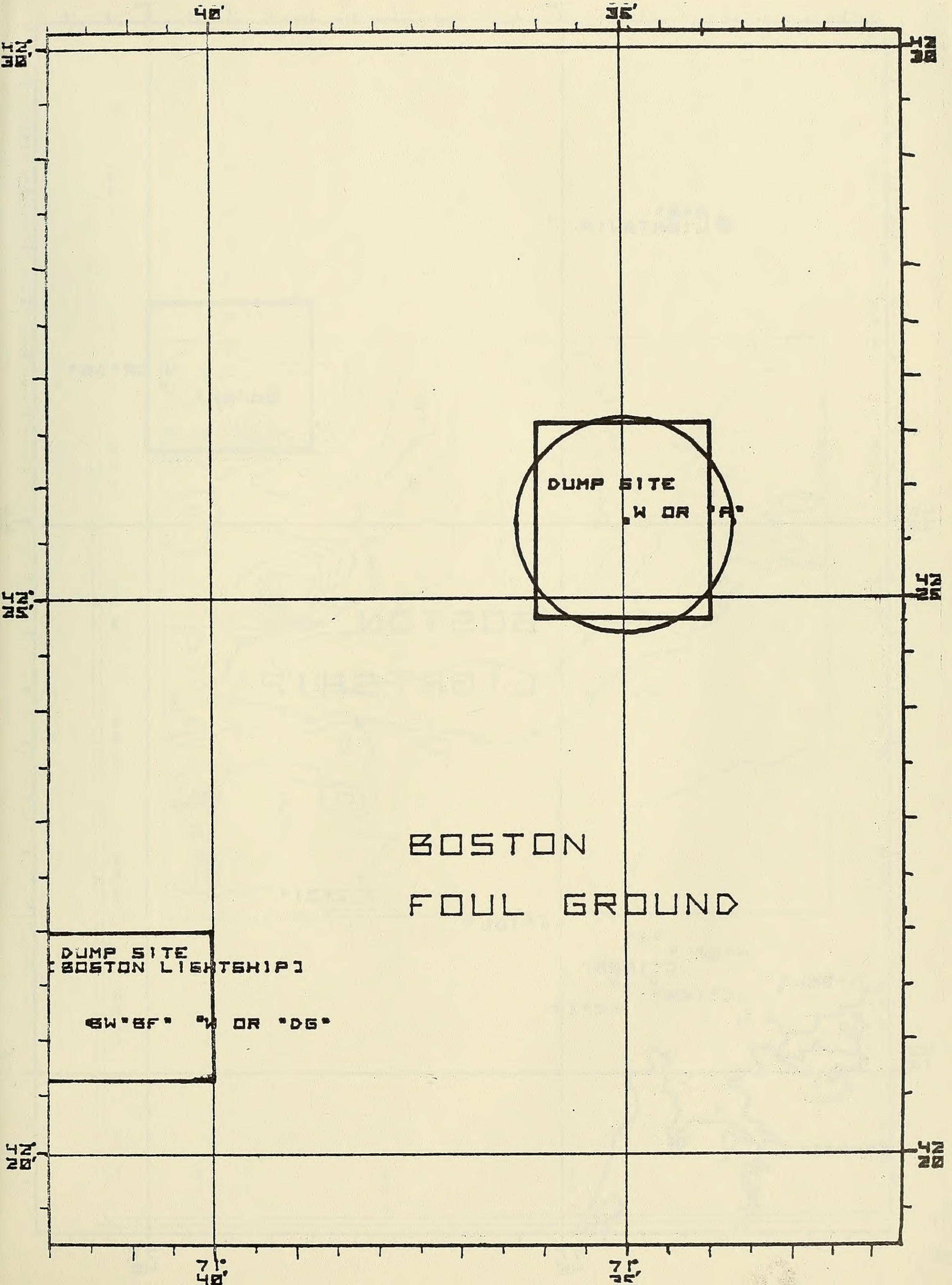
MASSACHUSETTS BAY DISPOSAL SITES

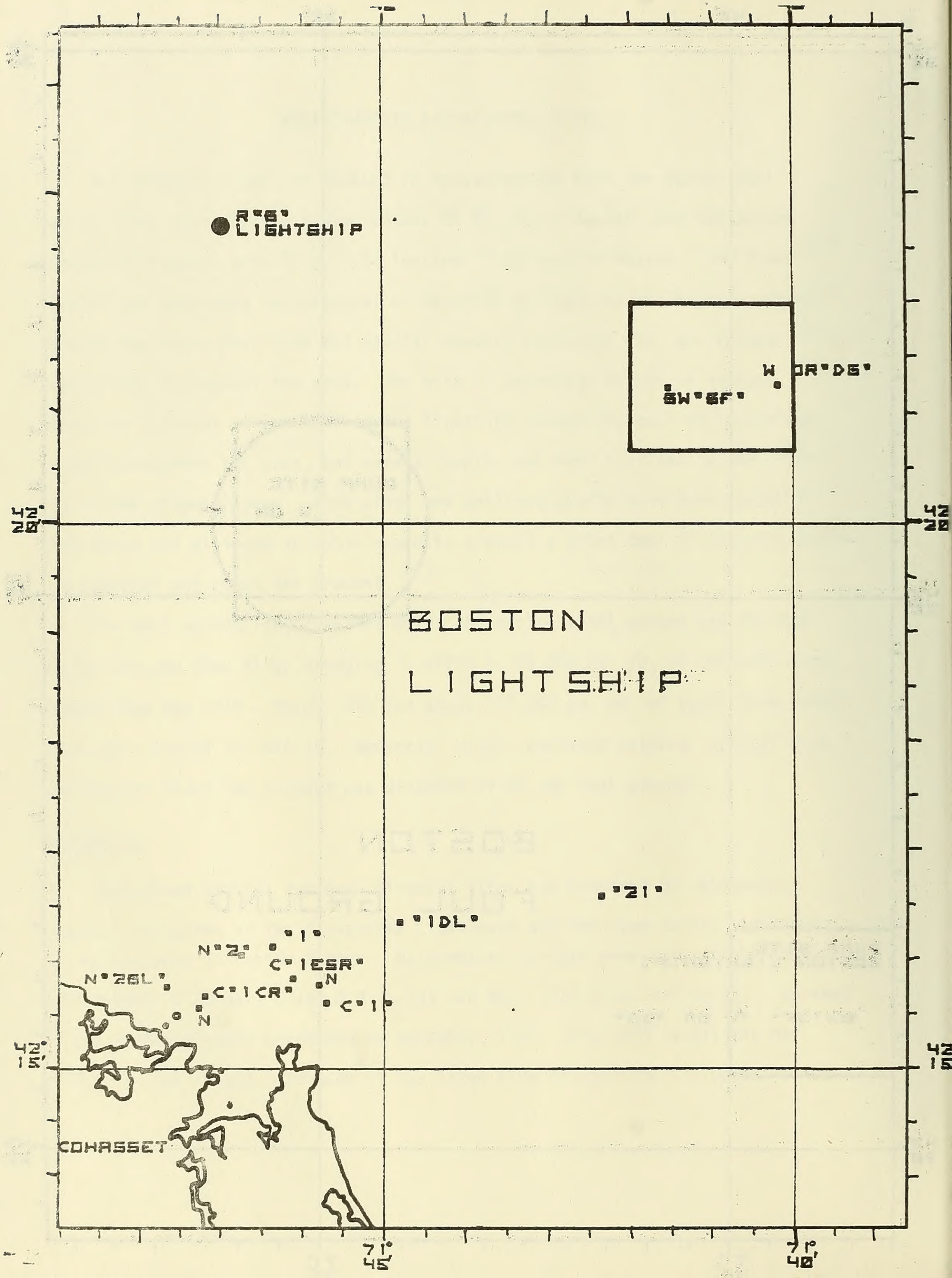
Two disposal sites are located in Massachusetts Bay; the Boston Foul Ground (Fig. D-1) located approximately 21 NM ENE of Boston, and the Boston Lightship Disposal Area (Fig. D-2) located 17 NM east of Boston. The "foul ground" has been used for disposal of material for many years, however, point dumping has never been used and spoils, wrecks, munitions etc. are spread extensively throughout the area. The site is currently in use at various times for disposal of spoils. At the lightship ground disposal of spoils was spread throughout the area, but recent dumping has been confined to the vicinity of the disposal buoy. Both clean and polluted spoils have been dumped in this area, and although no spoil mound is present a great deal of timbers, building material and rocks are present.

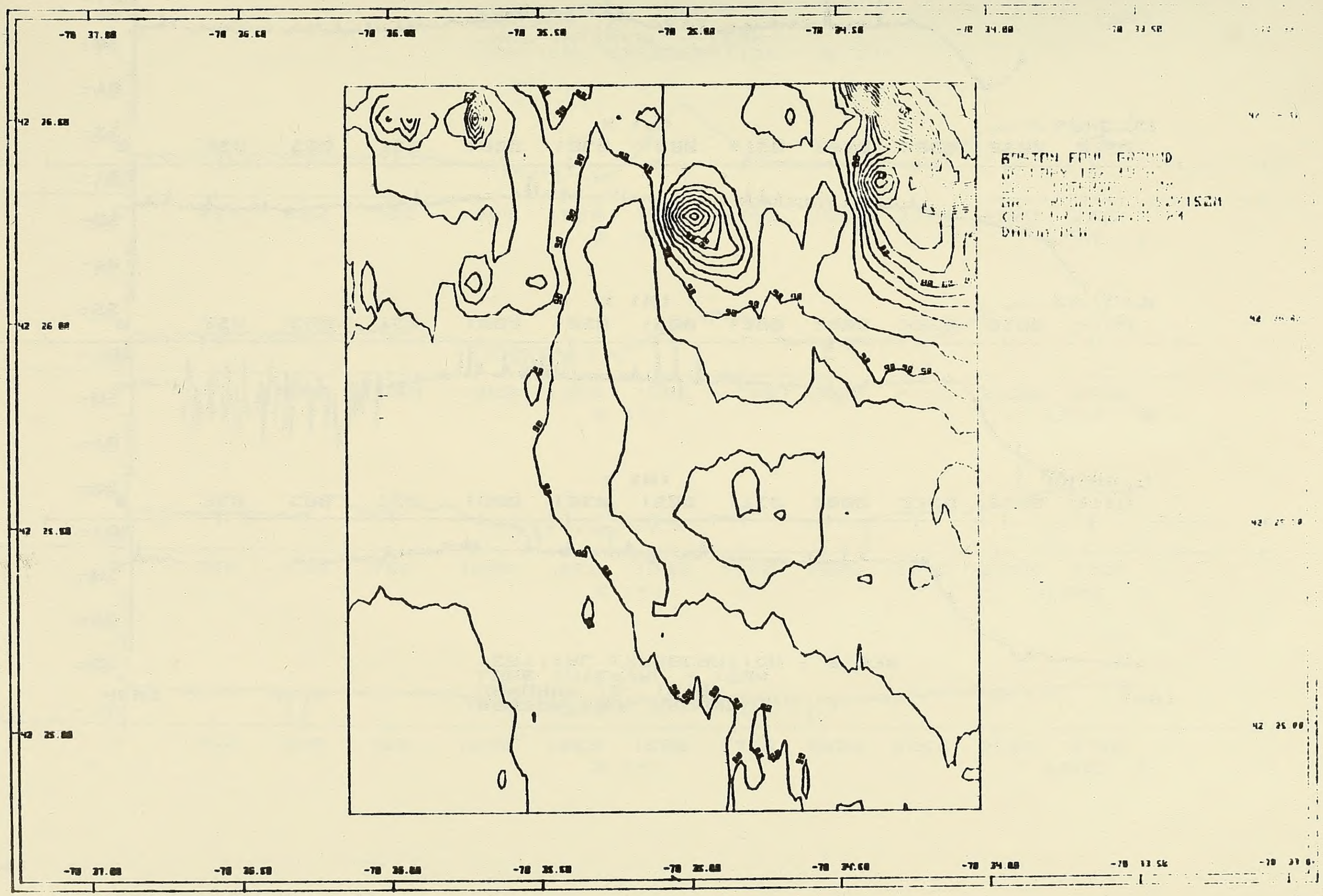
The most recent large project using the Boston Light ground was the Weymouth-Fore and Town River dredging in which 6,700,000 cu. yd. of sediment were dumped from May 1970 - March 1973 and about 115,000 cu. yd. of spoil from rocky areas were dumped in 1974-75. Recently, highly polluted material dredged from the Charles River Dam project was disposed of at the foul ground.

Bathymetry

Navigation control for both disposal sites was provided by trisponder stations installed at the Gloucester Lighthouse and the Long Island Lighthouse at the entrance to Boston Harbor. Bathymetric surveys were made at the Boston Foul Ground in January (Fig. D-3 (a-g)) and May, 1978 (Fig. D-4 (a-g)). Surveys at the Lightship were conducted in December, 1977, (Fig. D-5 (a-g)) and May, 1978 (Fig. D-6 (a-g)). Because of the large size of both these disposal sites

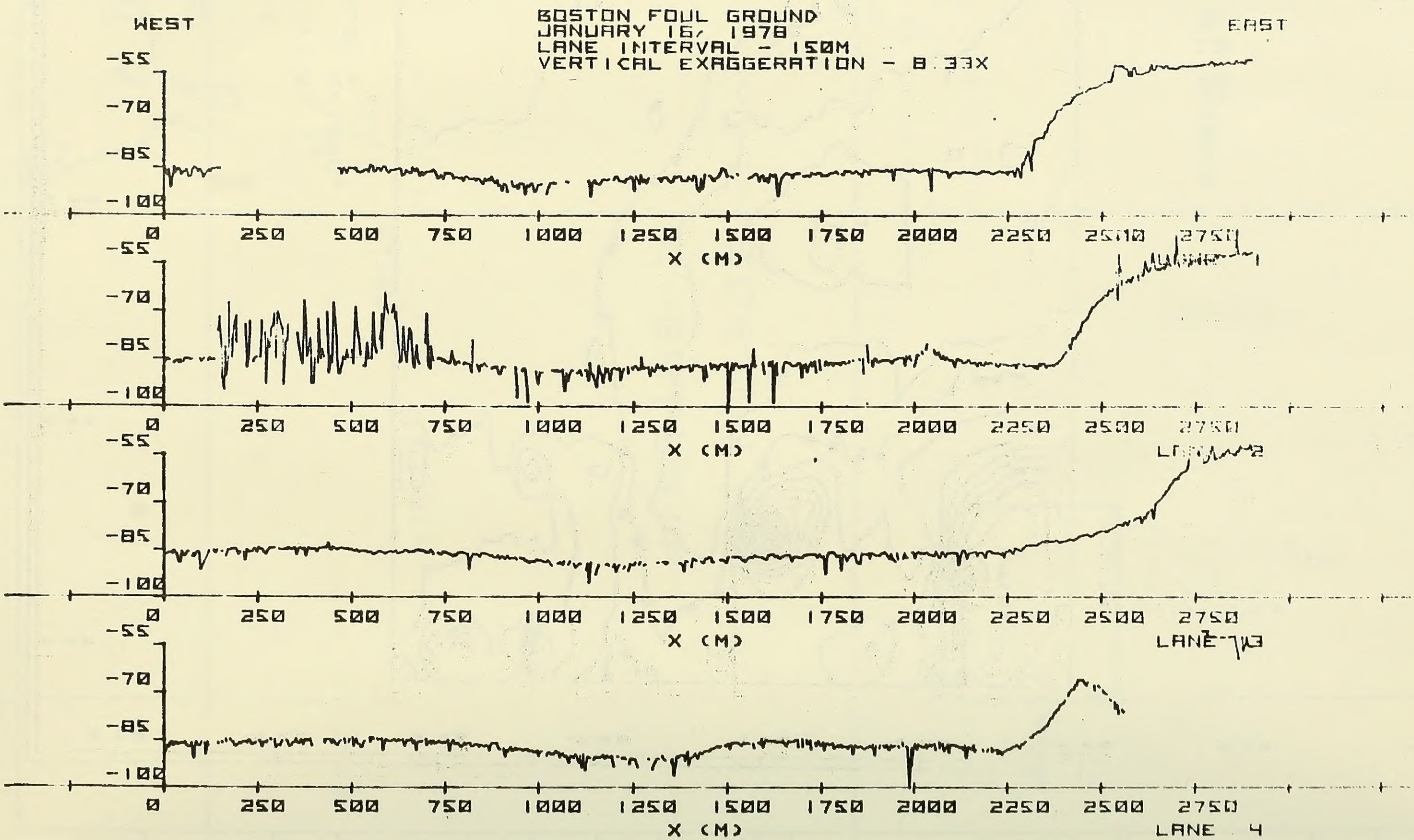

40'
35'
42° 30'
42 30
DUMP SITE
'W OR 'A'
42° 25'
42 25
BOSTON
FOUL GROUND
DUMP SITE
[BOSTON LIGHTSHIP]
'BW'BF' 'W OR 'DG'
42° 20'
42 20
71° 40'
71° 35'


R"6"
LIGHTSHIP
W OR"DS"
SW"SF"
42° 20'
42 20
BOSTON
LIGHTSHIP
"21"
"IDL"
"1"
N"2"
C"1ESR"
N"2BL"
N
C"1CR"
N
C"1"
42° 15'
42 15
COHASSET
71° 45'
71° 40'

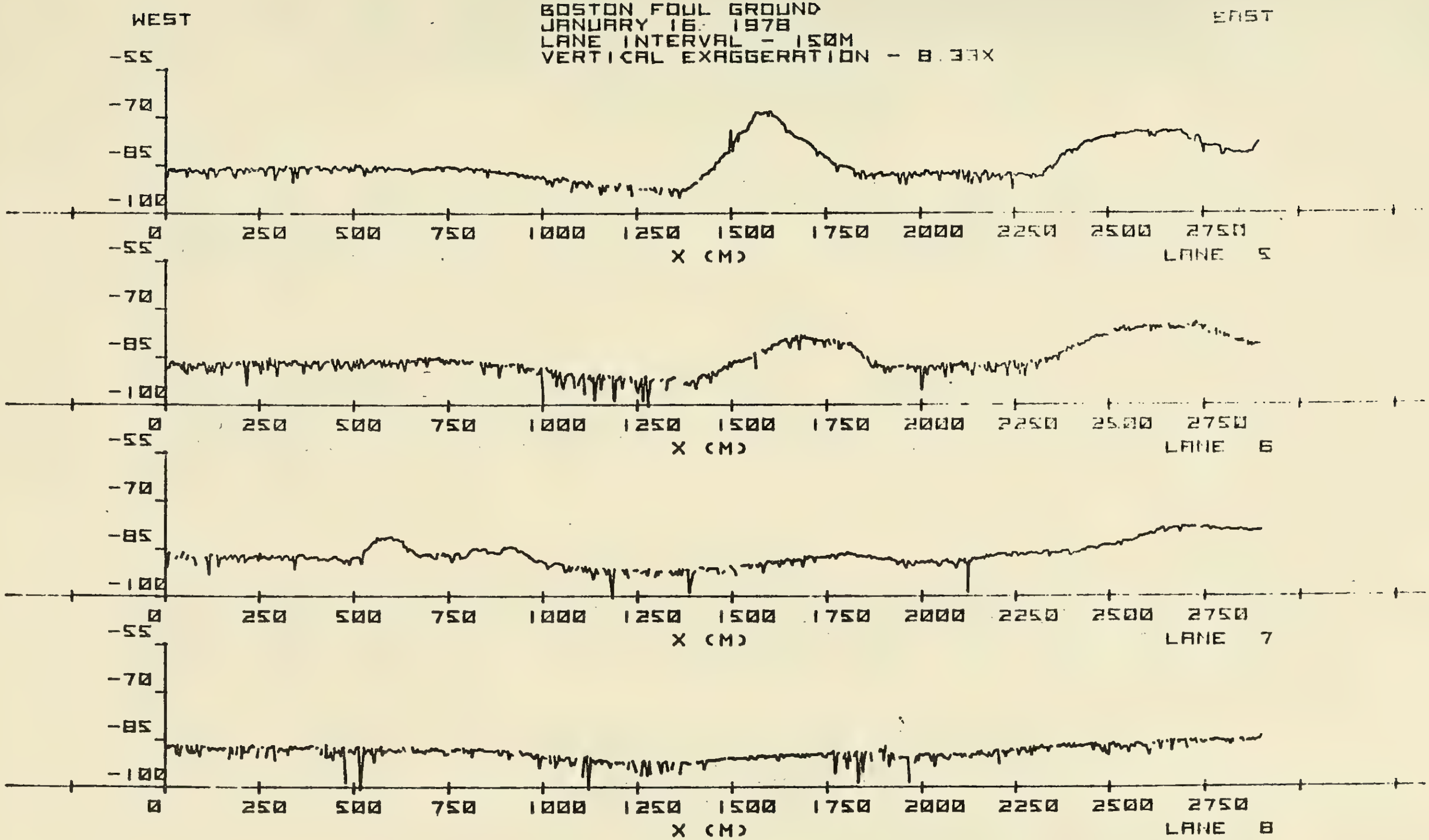


-70 37.00
-70 36.50
-70 36.00
-70 35.50
-70 35.00
-70 34.50
-70 34.00
-70 33.50
42 26.50
42 26.00
42 25.50
42 25.00
BOSTON FOUL GROUND

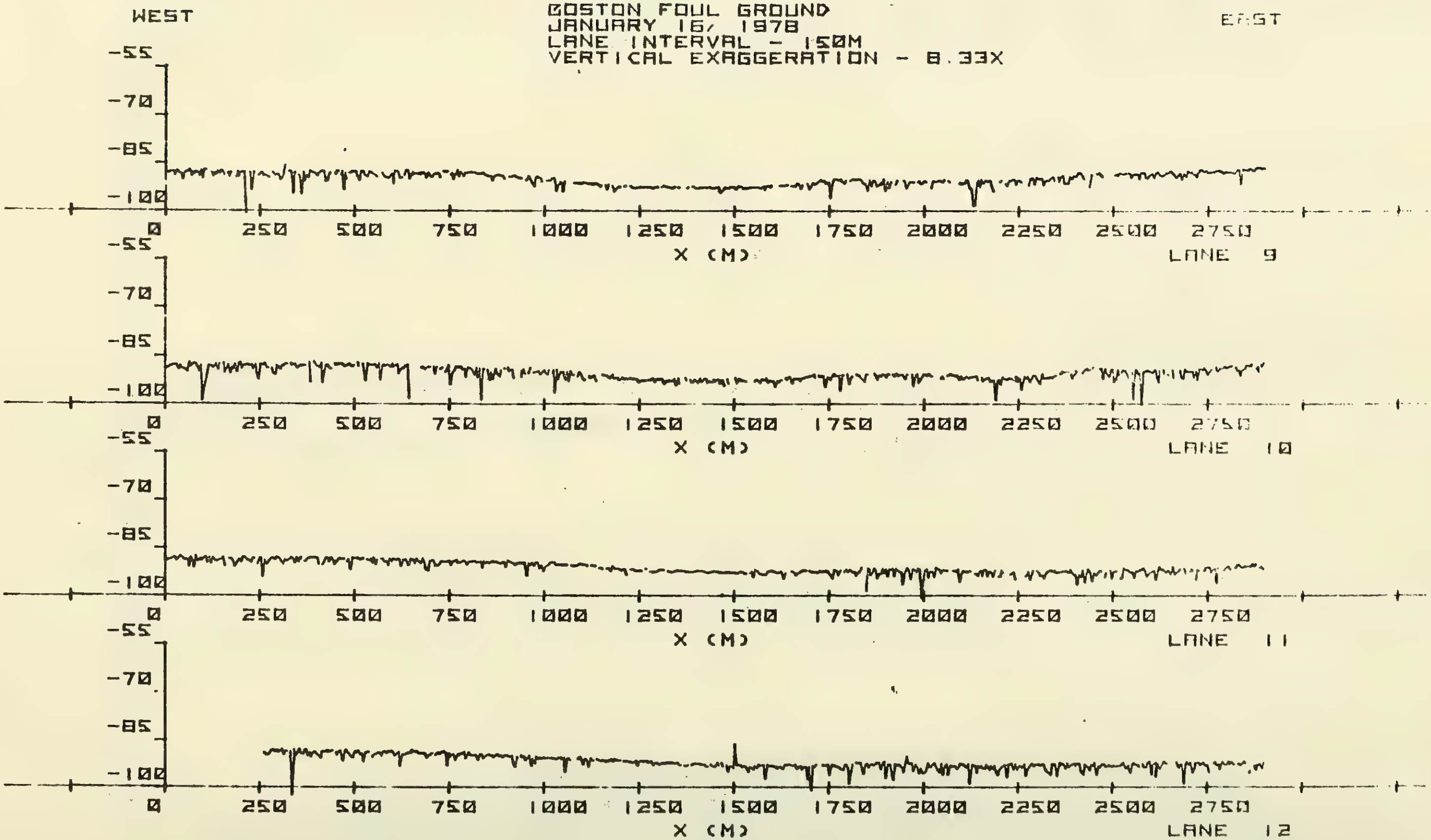
D 3a


BOSTON FOUL GROUND
JANUARY 16, 1978
LANE INTERVAL - 150M
VERTICAL EXAGGERATION - 8.33X
WEST
EAST
-55
-70
-85
-100
0
250
500
750
1000
1250
1500
1750
2000
2250
2500
2750
X (M)
LANE 2
LANE 3
LANE 4

BOSTON FOUL GROUND
JANUARY 16 1978
LANE INTERVAL - 150M
VERTICAL EXAGGERATION - 8.33X

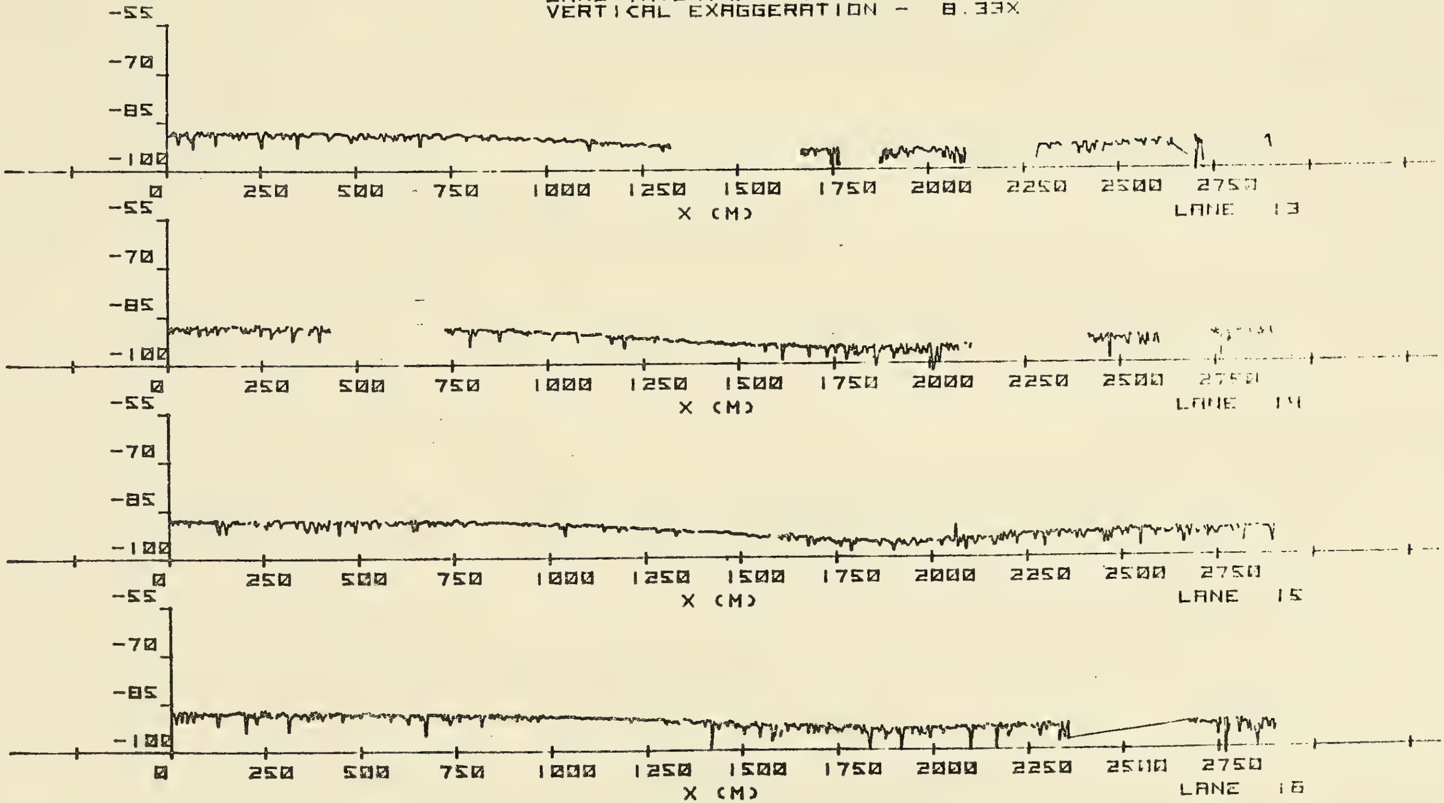


D-3c

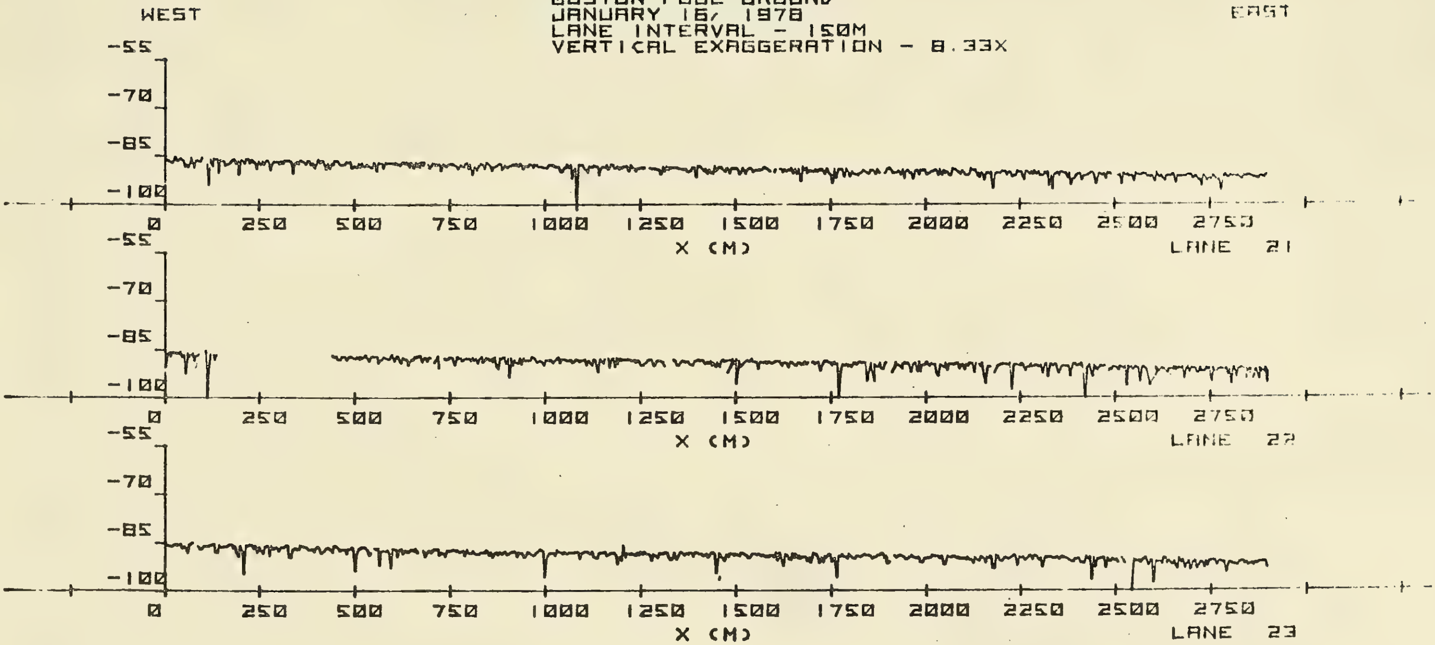

BOSTON FOUL GROUND
JANUARY 16, 1978
LANE INTERVAL - 150M
VERTICAL EXAGGERATION - 8.33X

D-3d

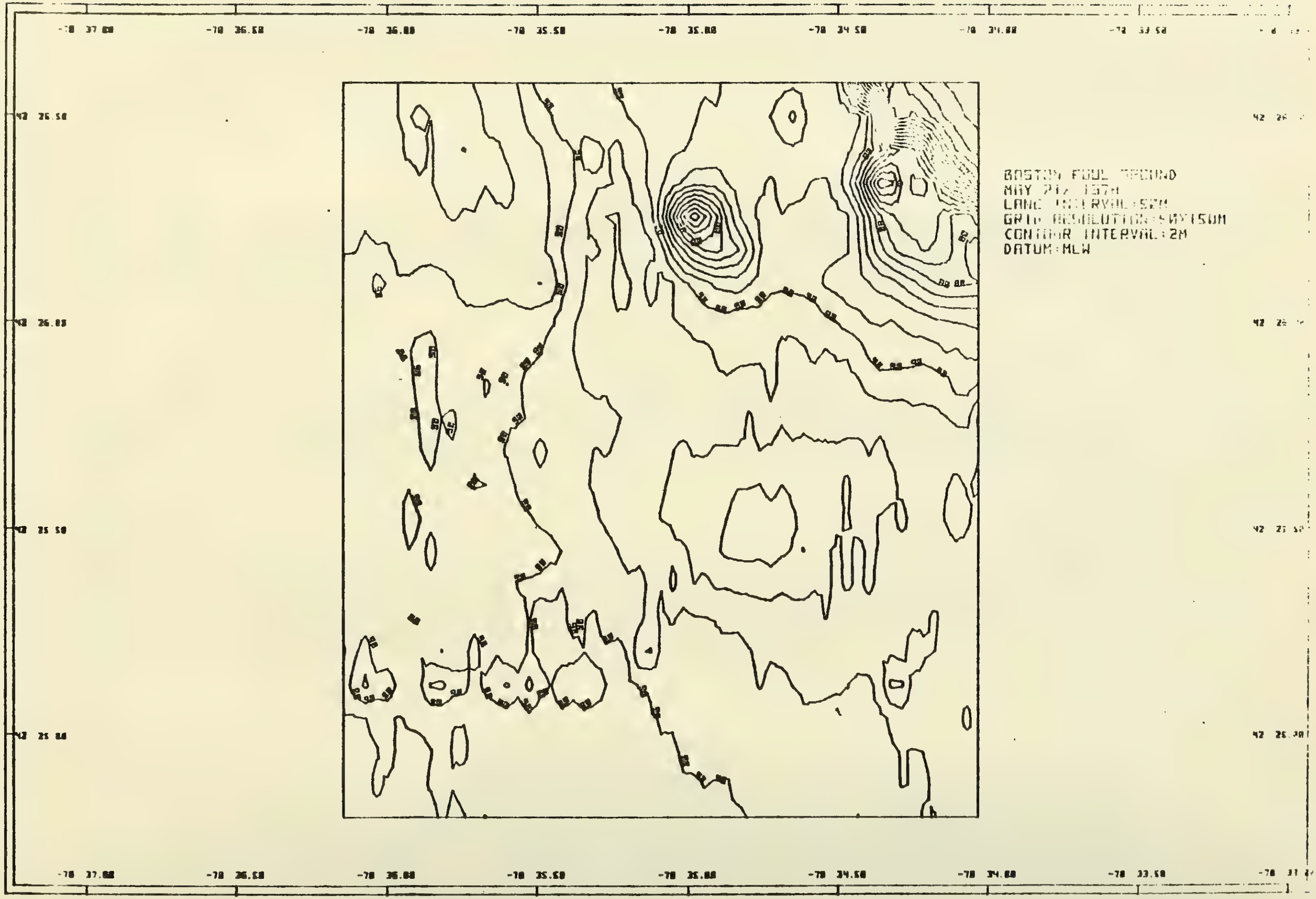
BOSTON FOUL GROUND
JANUARY 16, 1978
LANE INTERVAL - 150M
VERTICAL EXAGGERATION - 8.33X



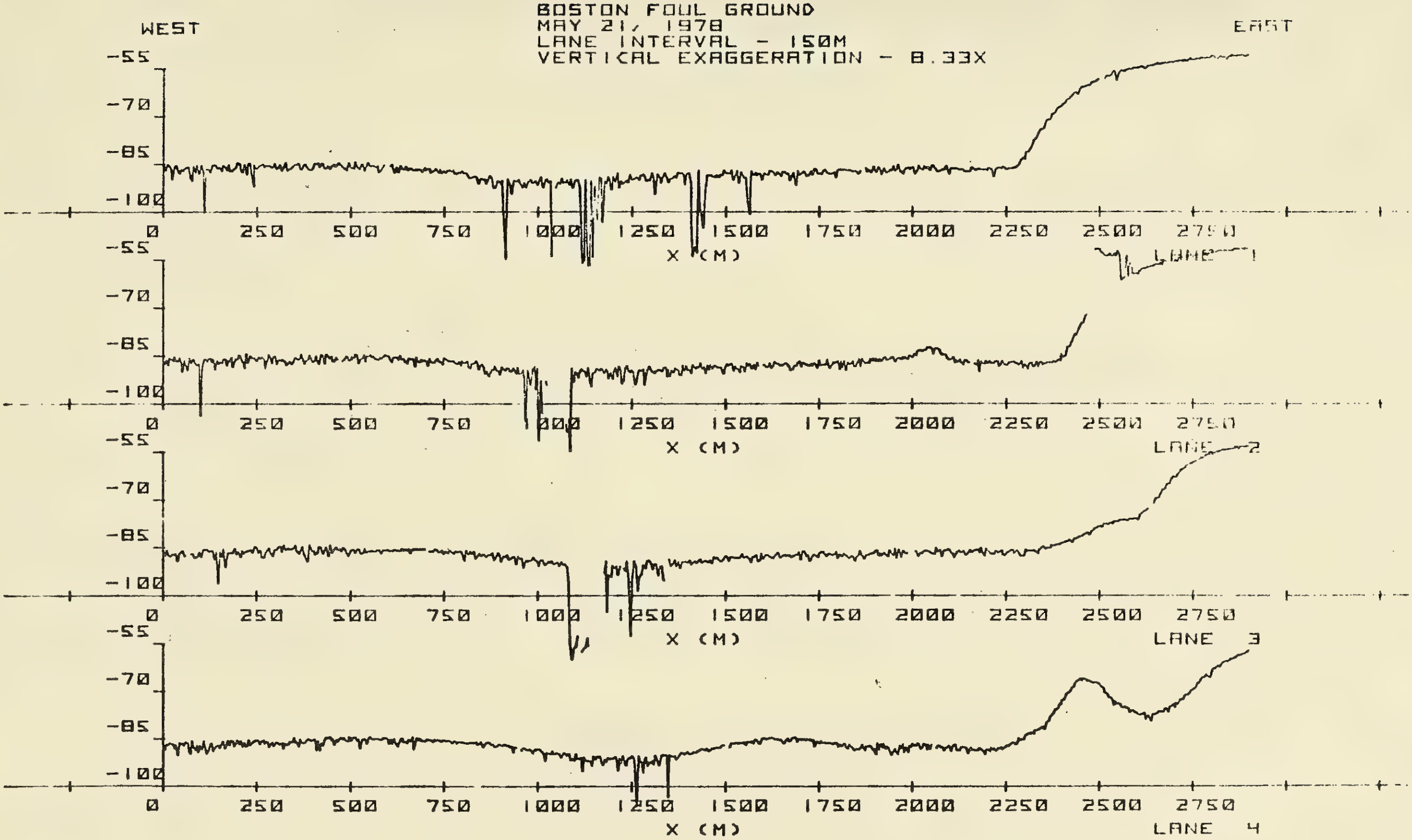
BOSTON FOUL GROUND
JANUARY 16, 1978
LANE INTERVAL - 150M
VERTICAL EXAGGERATION - 8.33X



D-3g

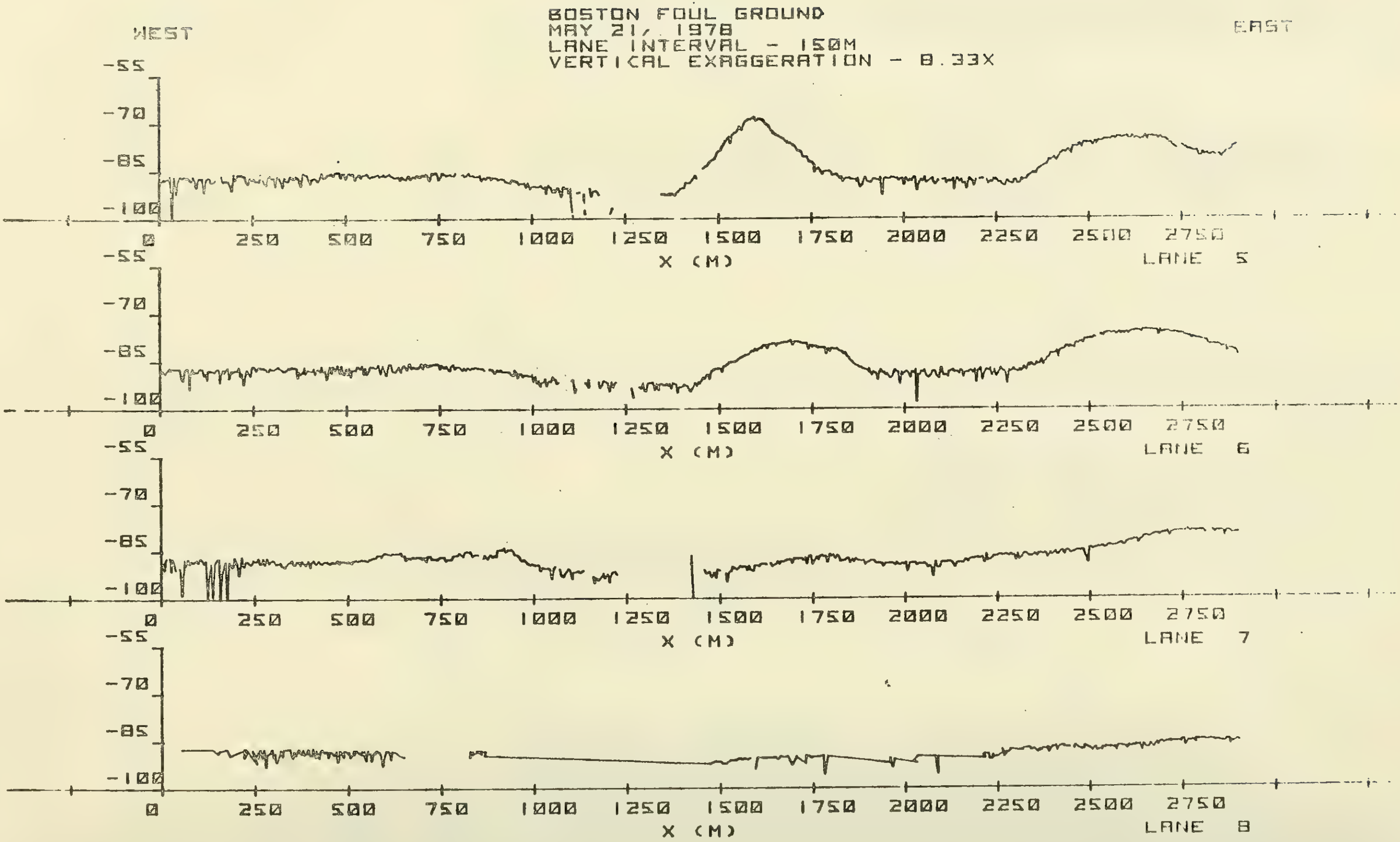

BOSTON FOUL GROUND
MAY 21, 1979
LANE INTERVAL:50M
GRID RESOLUTION:50X150M
CONTOUR INTERVAL:2M
DATUM:MLW
-70 37.00
-70 36.50
-70 36.00
-70 35.50
-70 35.00
-70 34.50
-70 34.00
-70 33.50
42 26.50
42 26.00
42 25.50
42 25.00

D-4a



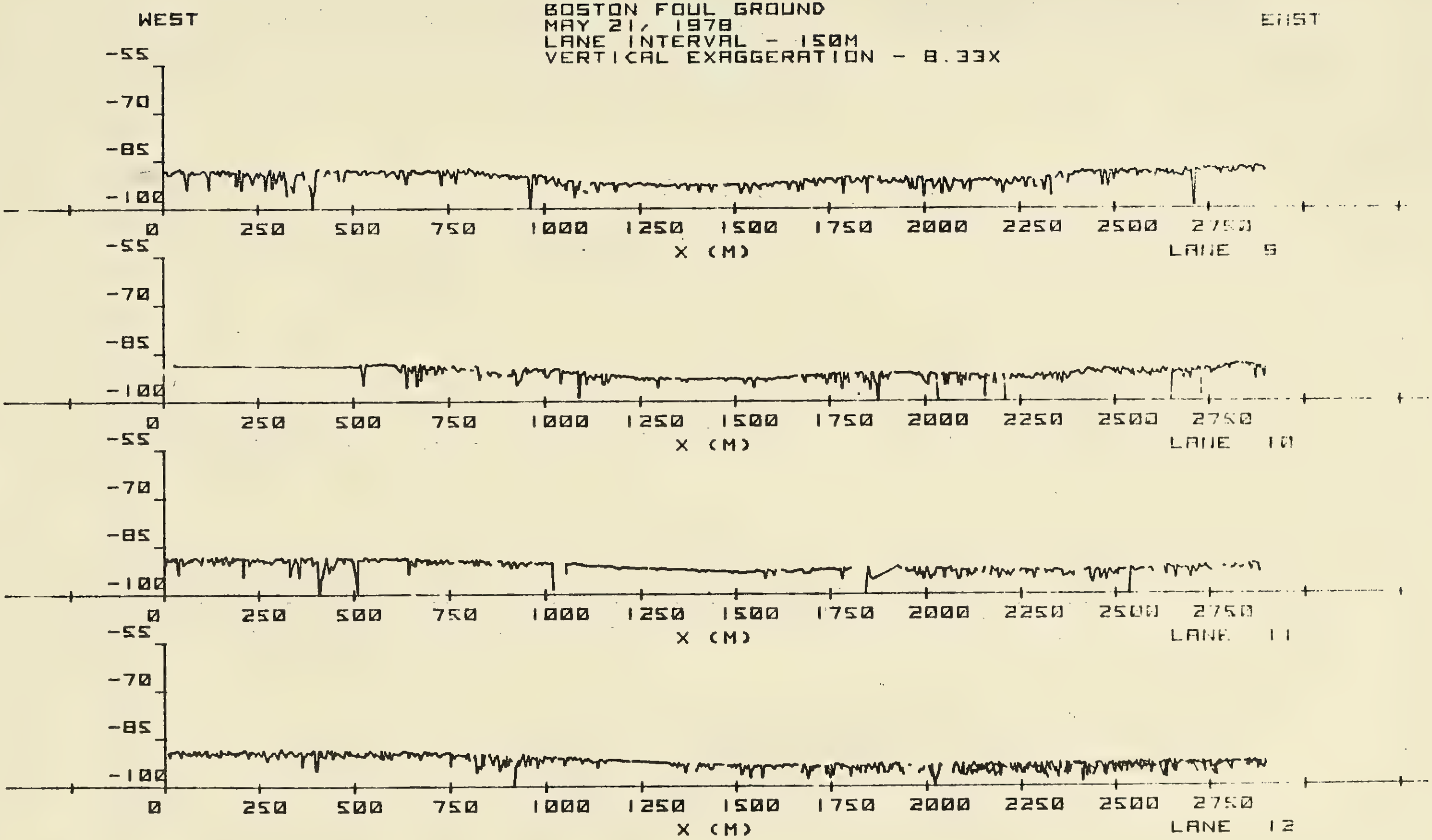
BOSTON FOUL GROUND
MAY 21, 1978
LANE INTERVAL - 150M
VERTICAL EXAGGERATION - 8.33X

D 48



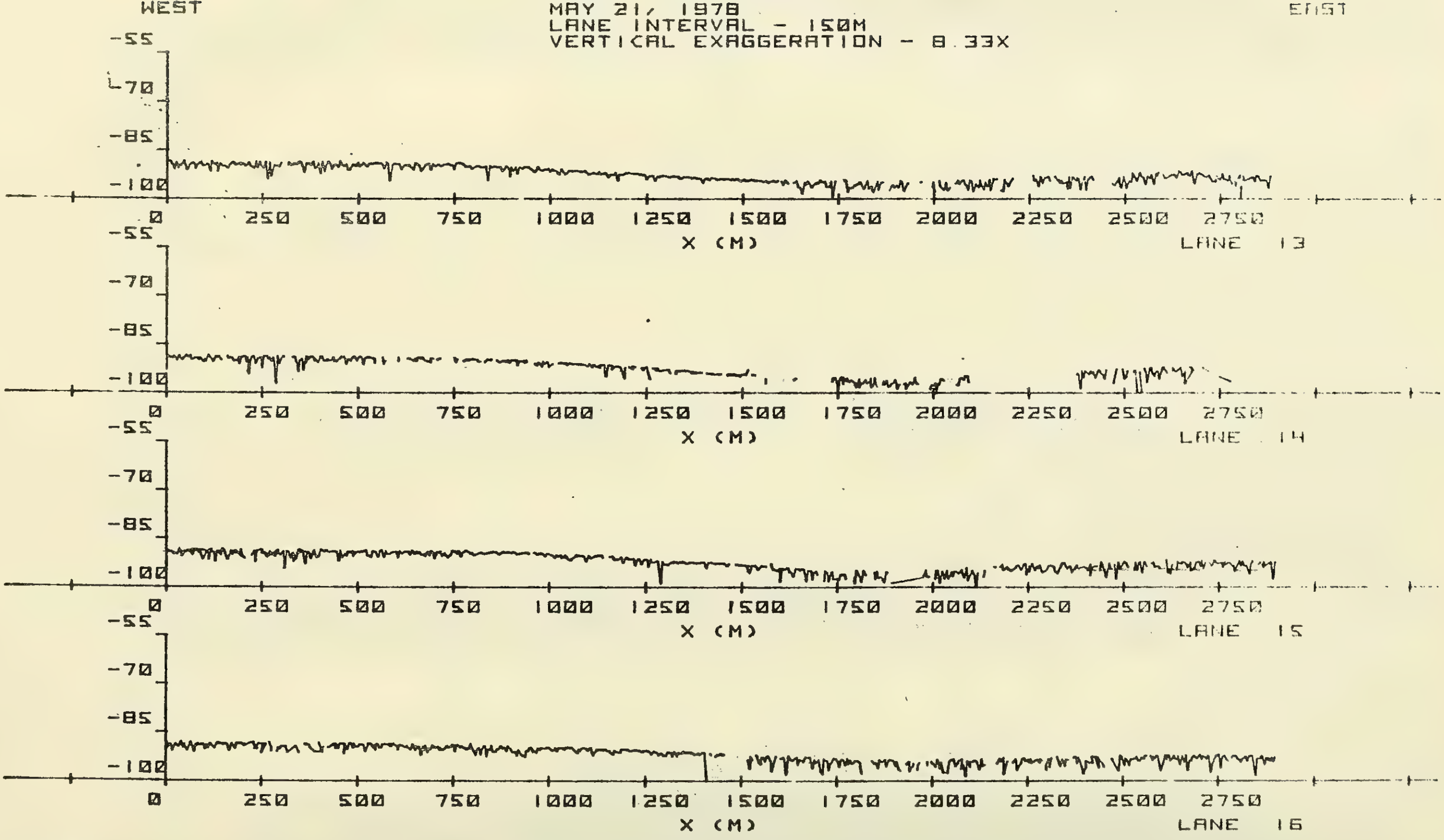
BOSTON FOUL GROUND
MAY 21, 1978
LANE INTERVAL - 150M
VERTICAL EXAGGERATION - 8.33X

BOSTON FOUL GROUND
MAY 21, 1978
LANE INTERVAL - 150M
VERTICAL EXAGGERATION - 8.33X



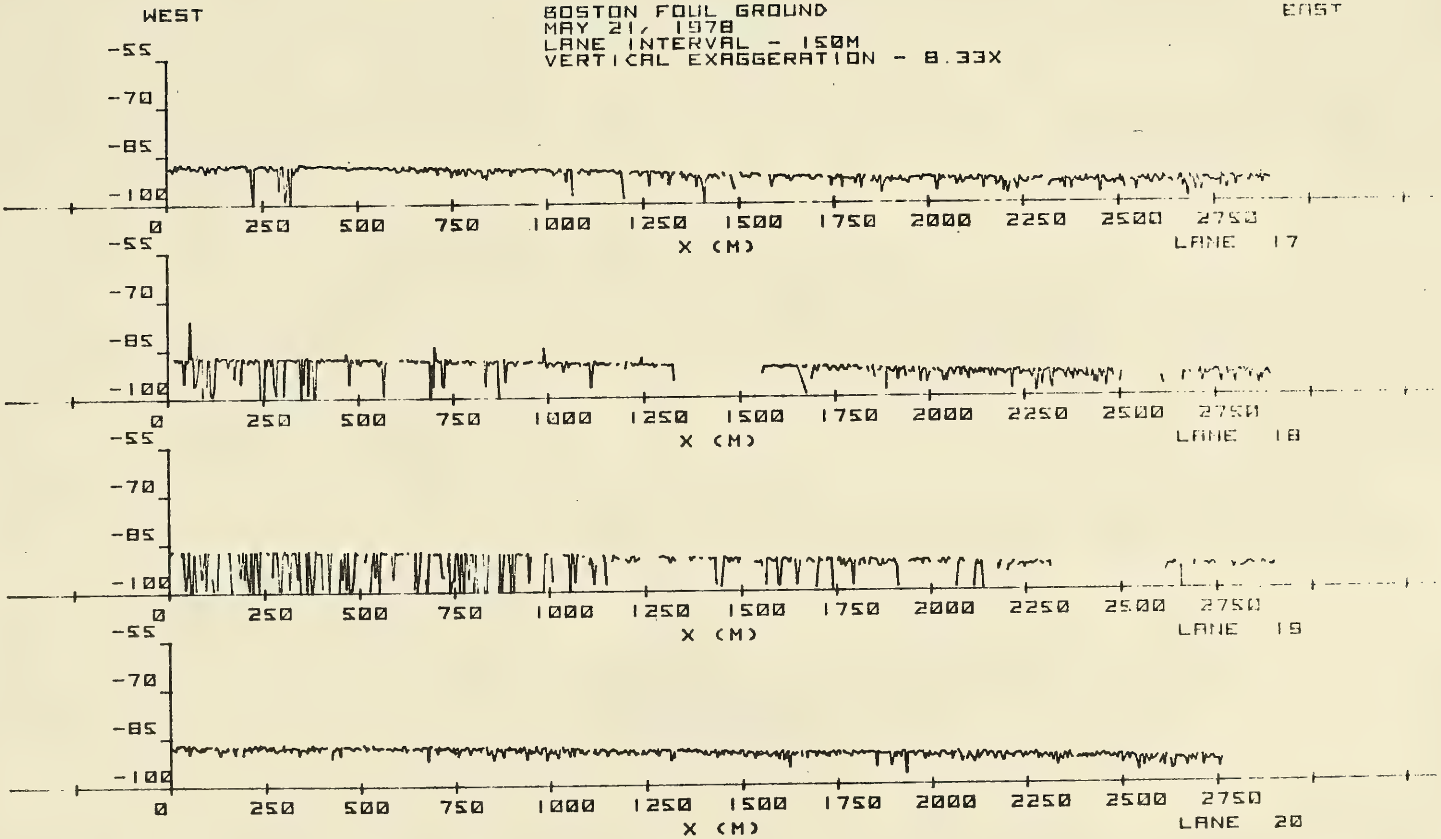
U·4d

BOSTON FOUL GROUND
MAY 21, 1978
LANE INTERVAL - 150M
VERTICAL EXAGGERATION - 8.33X



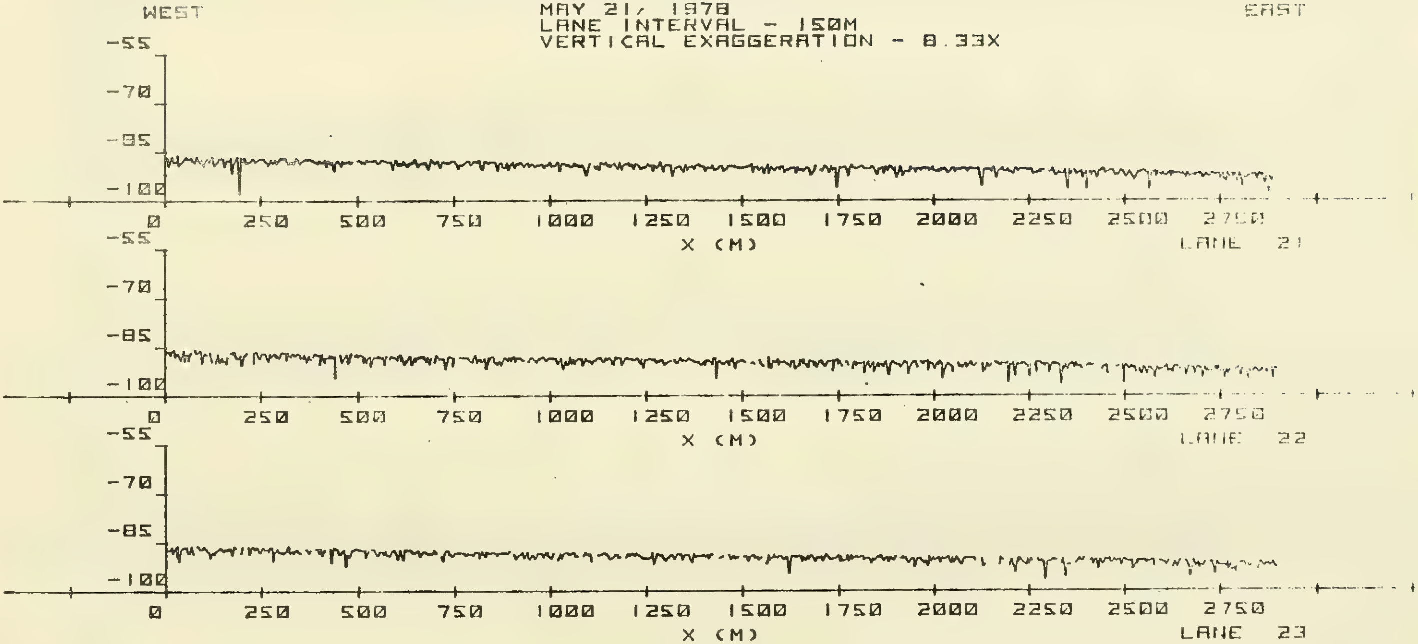
D-4a

BOSTON FOUL GROUND
MAY 21, 1978
LANE INTERVAL - 150M
VERTICAL EXAGGERATION - 8.33X

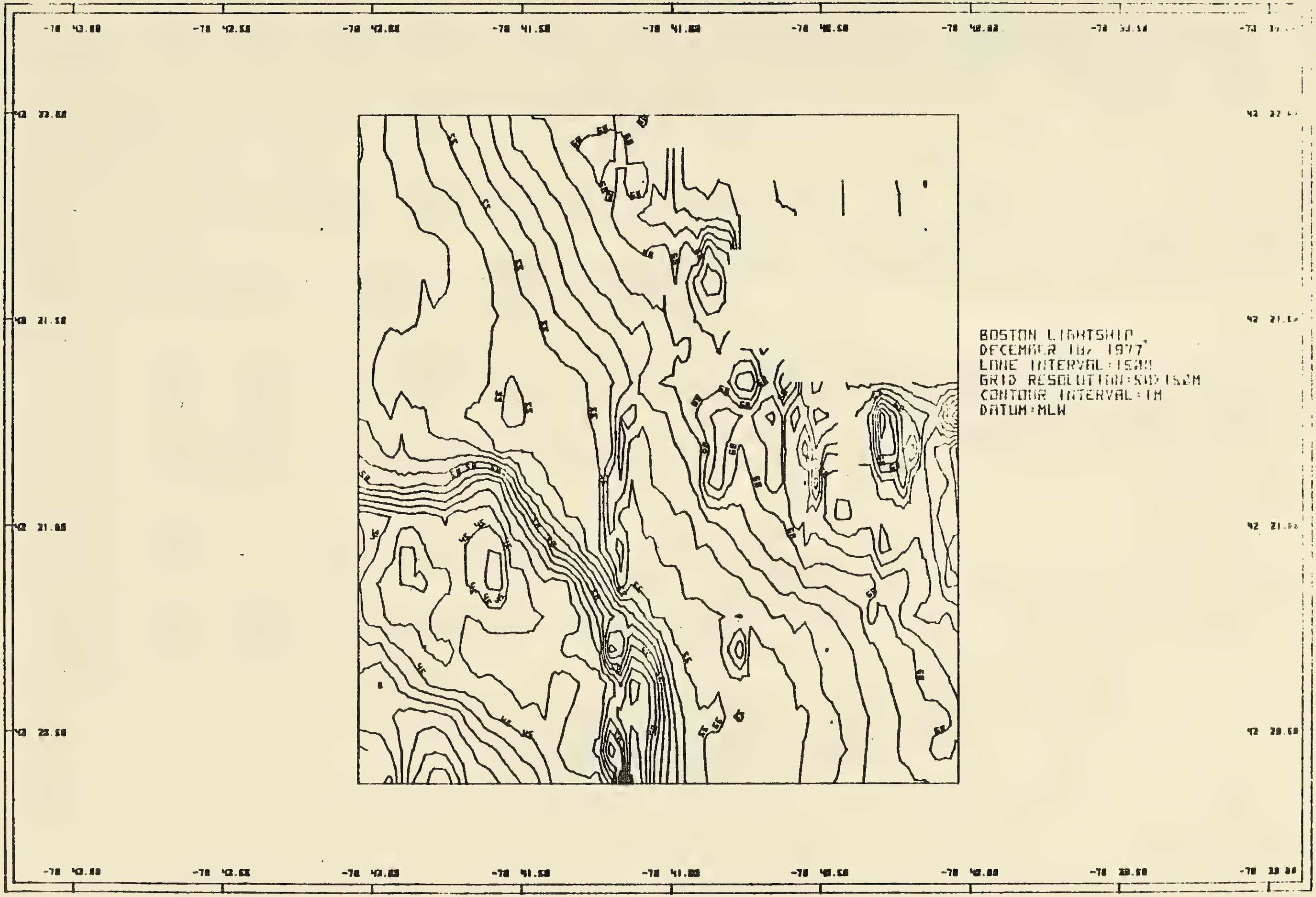


D-4f

BOSTON FOUL GROUND
MAY 21, 1978
LANE INTERVAL - 150M
VERTICAL EXAGGERATION - 8.33X



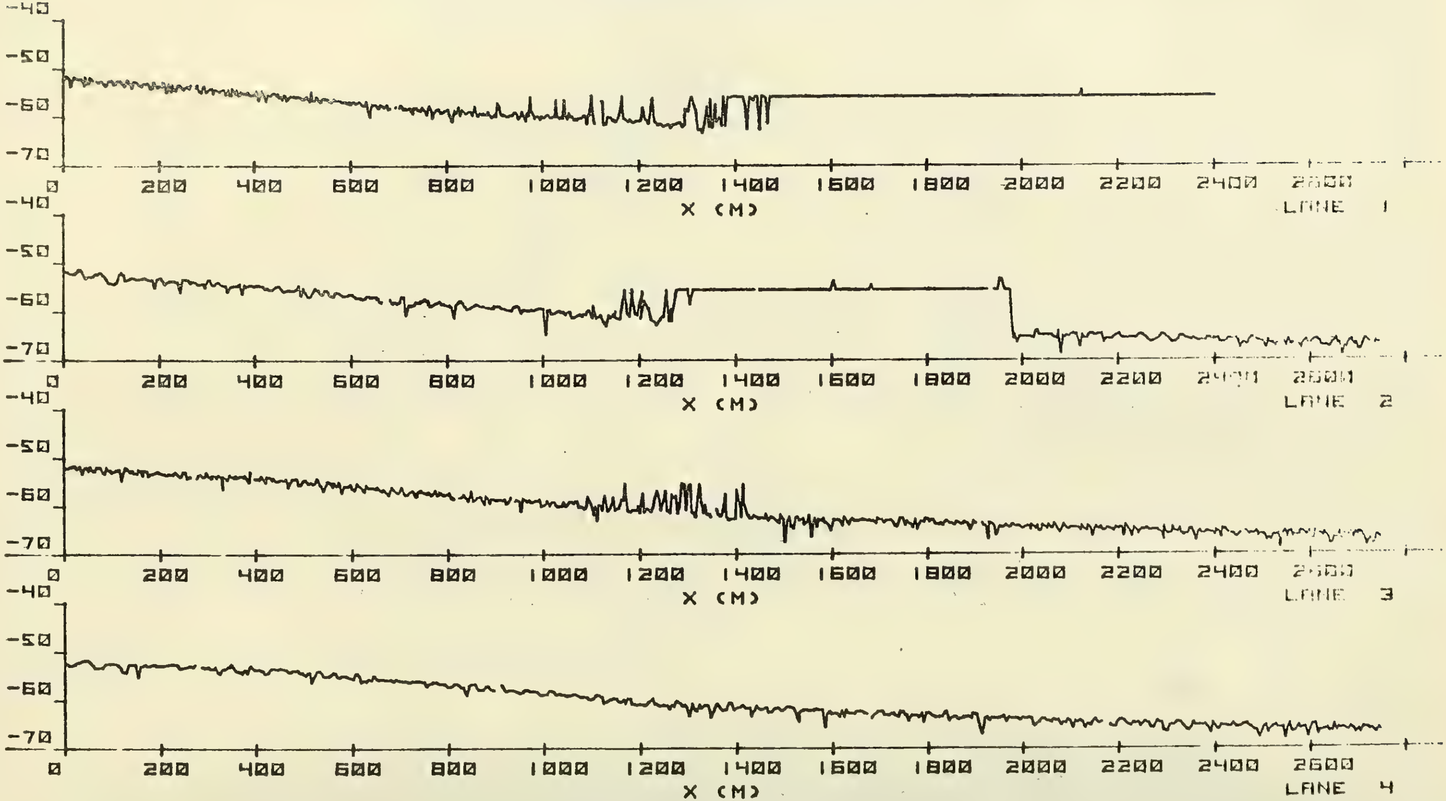
N=4



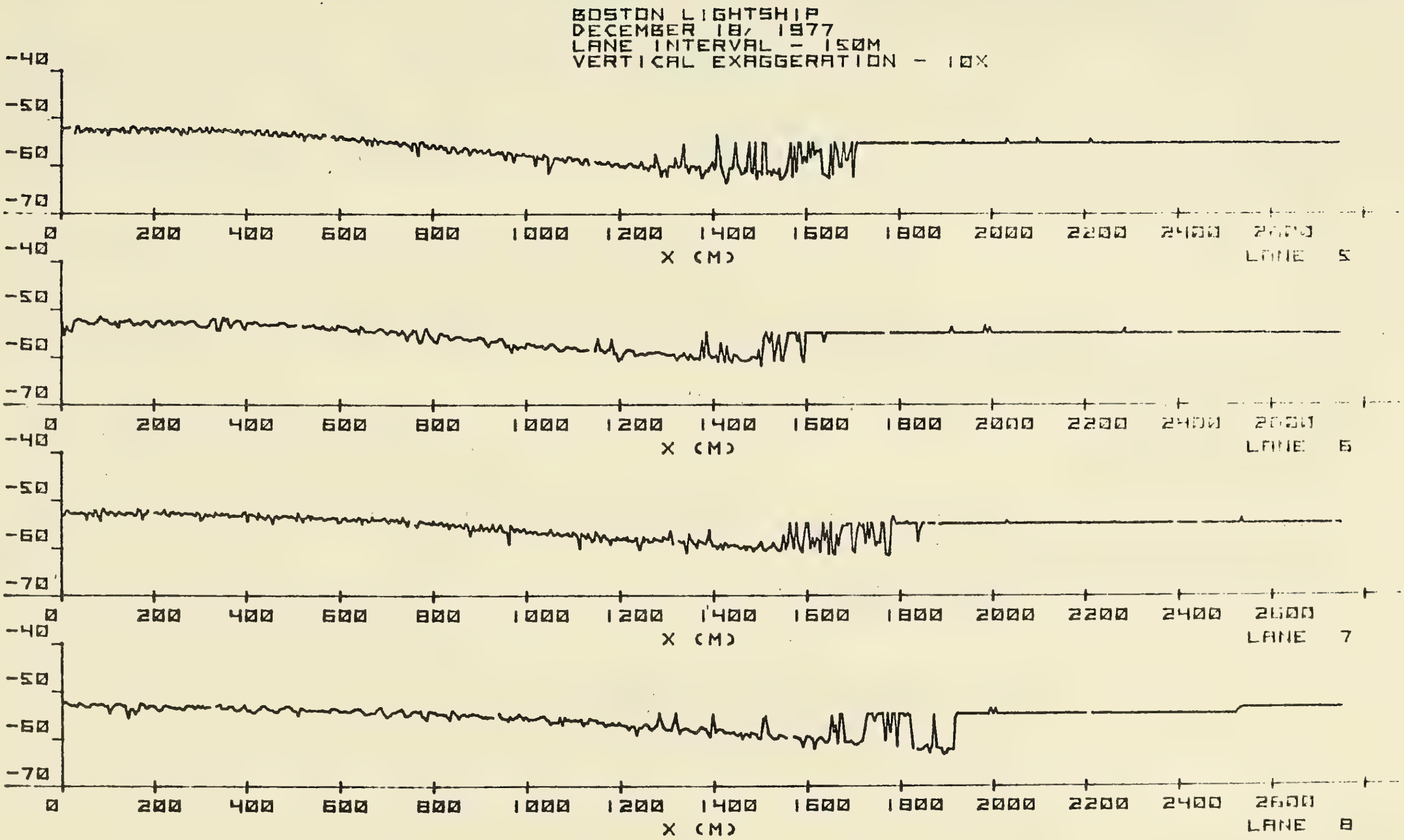
BOSTON LIGHTSHIP
DECEMBER 10, 1977
LANE INTERVAL:150M
GRID RESOLUTION:50X150M
CONTOUR INTERVAL:1M
DATUM:MLW

D. 5a

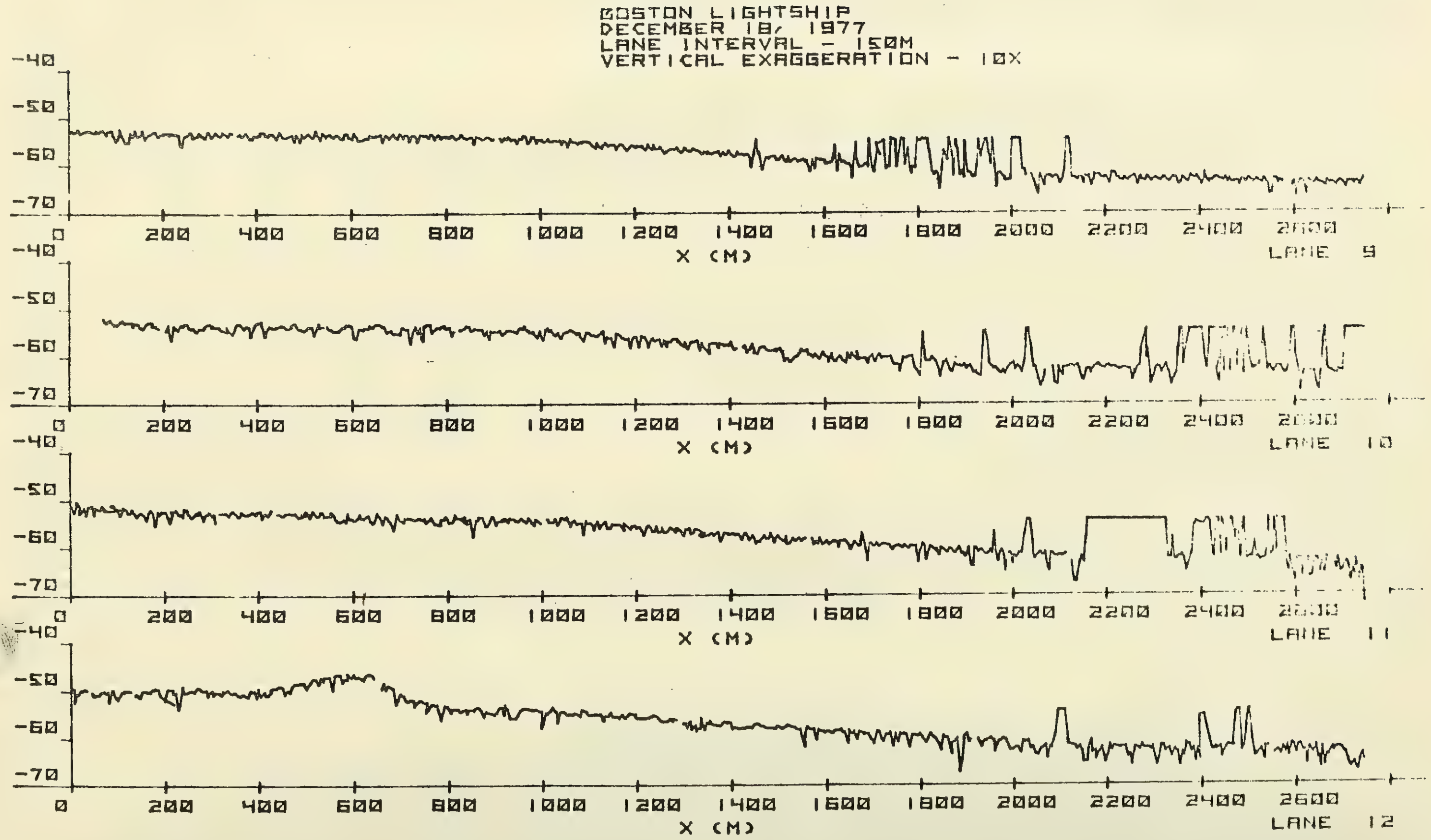
BOSTON LIGHTSHIP
DECEMBER 18, 1977
LANE INTERVAL - 150M
VERTICAL EXAGGERATION - 10X



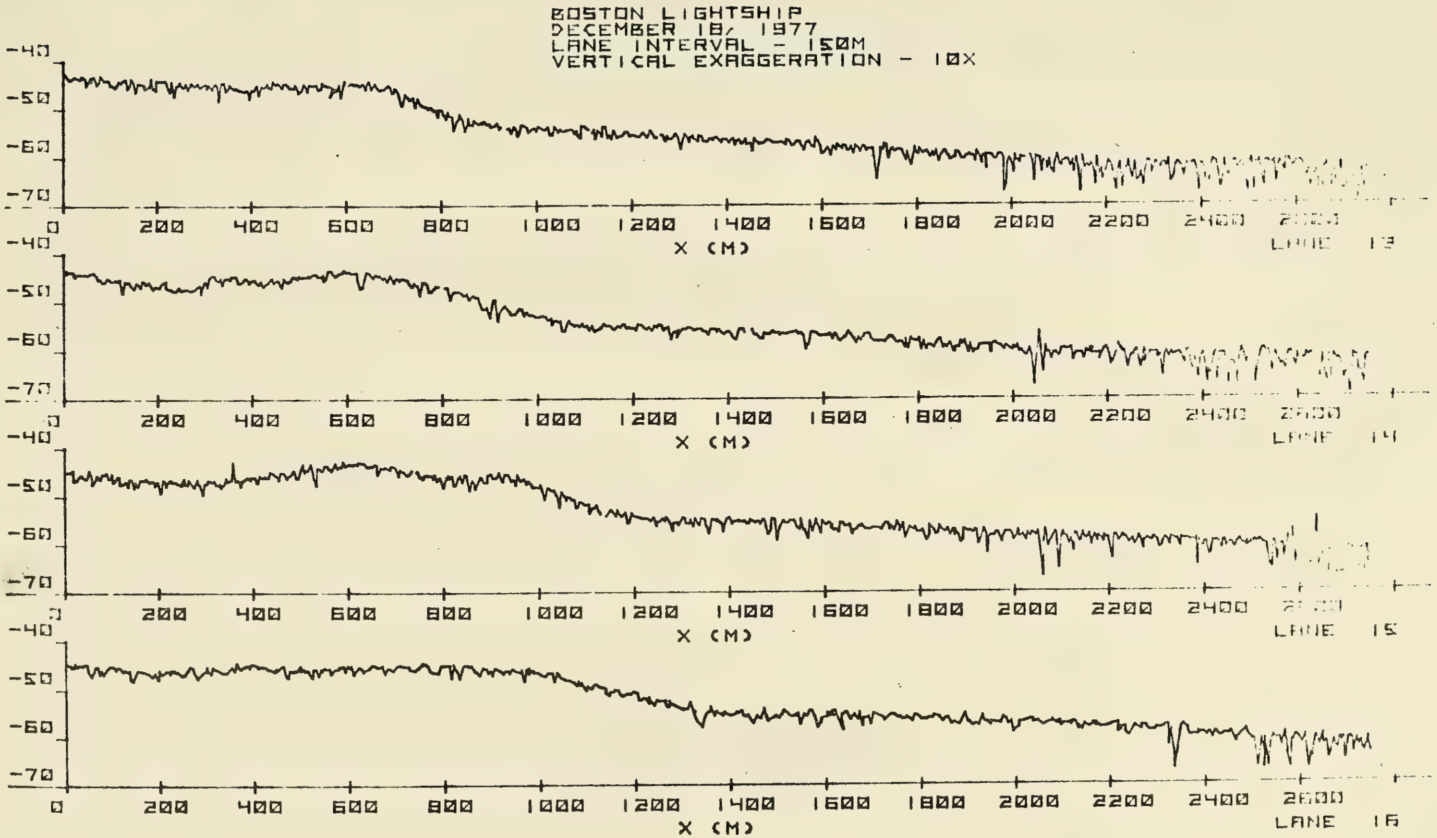
D-5b


BOSTON LIGHTSHIP
DECEMBER 18, 1977
LANE INTERVAL - 150M
VERTICAL EXAGGERATION - 10X
-40
-50
-60
-70
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
X (M)
LANE 5
LANE 6
LANE 7
LANE 8

D. 5c

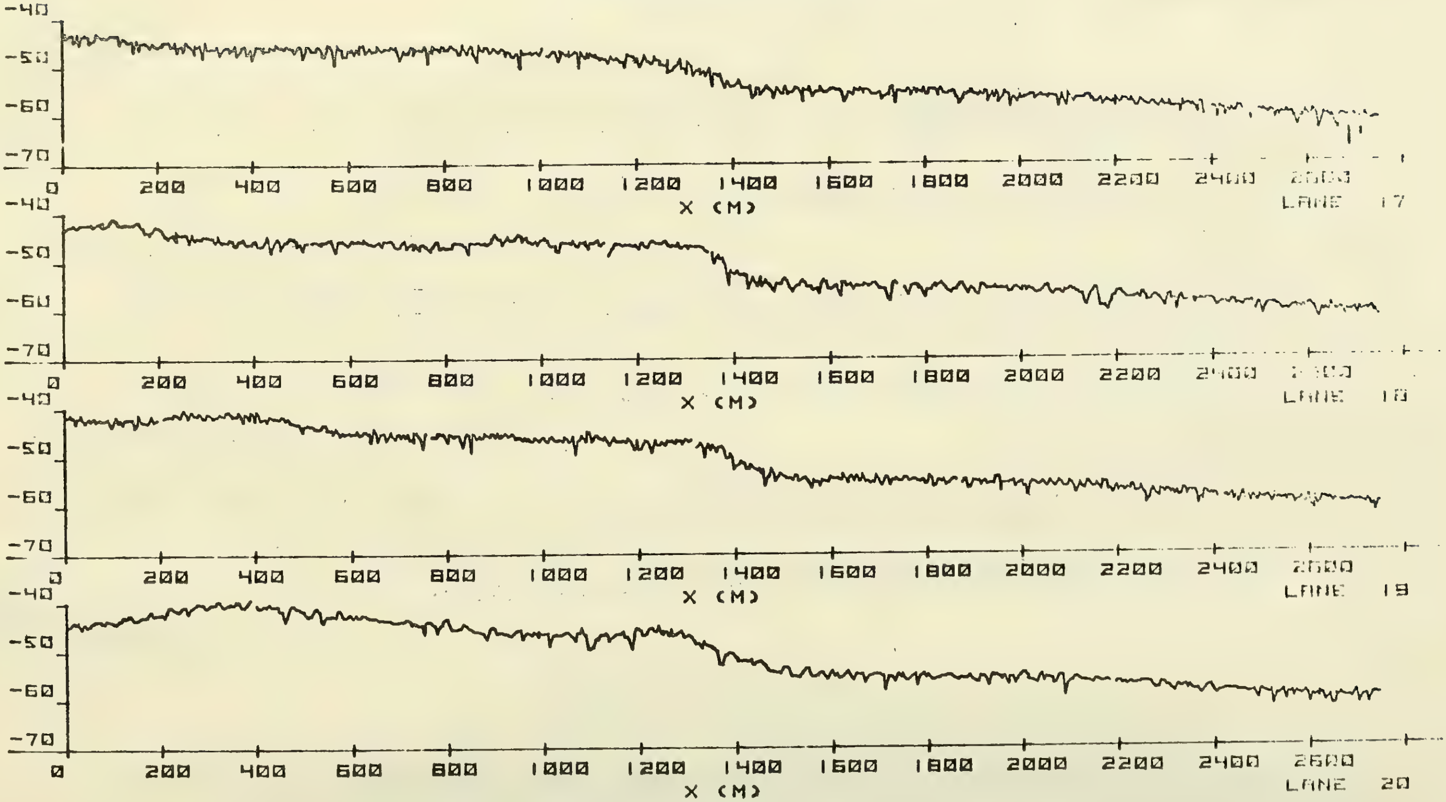

BOSTON LIGHTSHIP
DECEMBER 18, 1977
LANE INTERVAL - 150M
VERTICAL EXAGGERATION - 10X

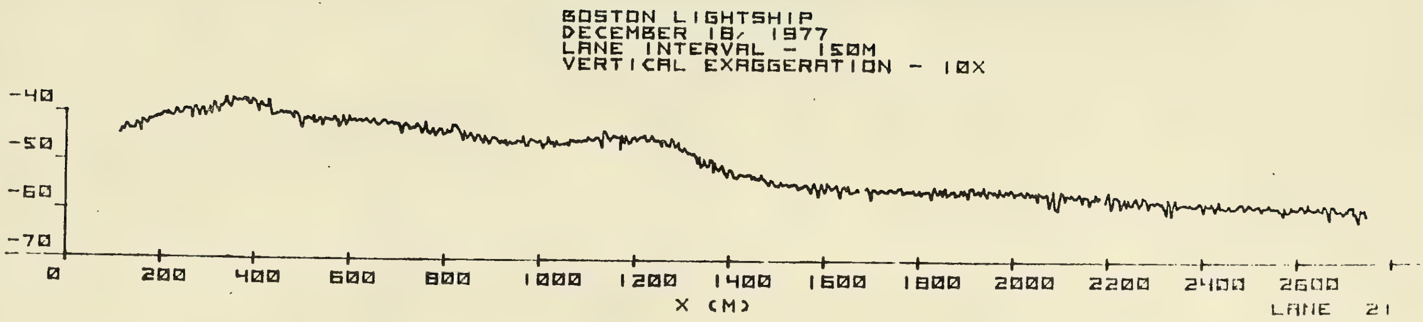
D-5d

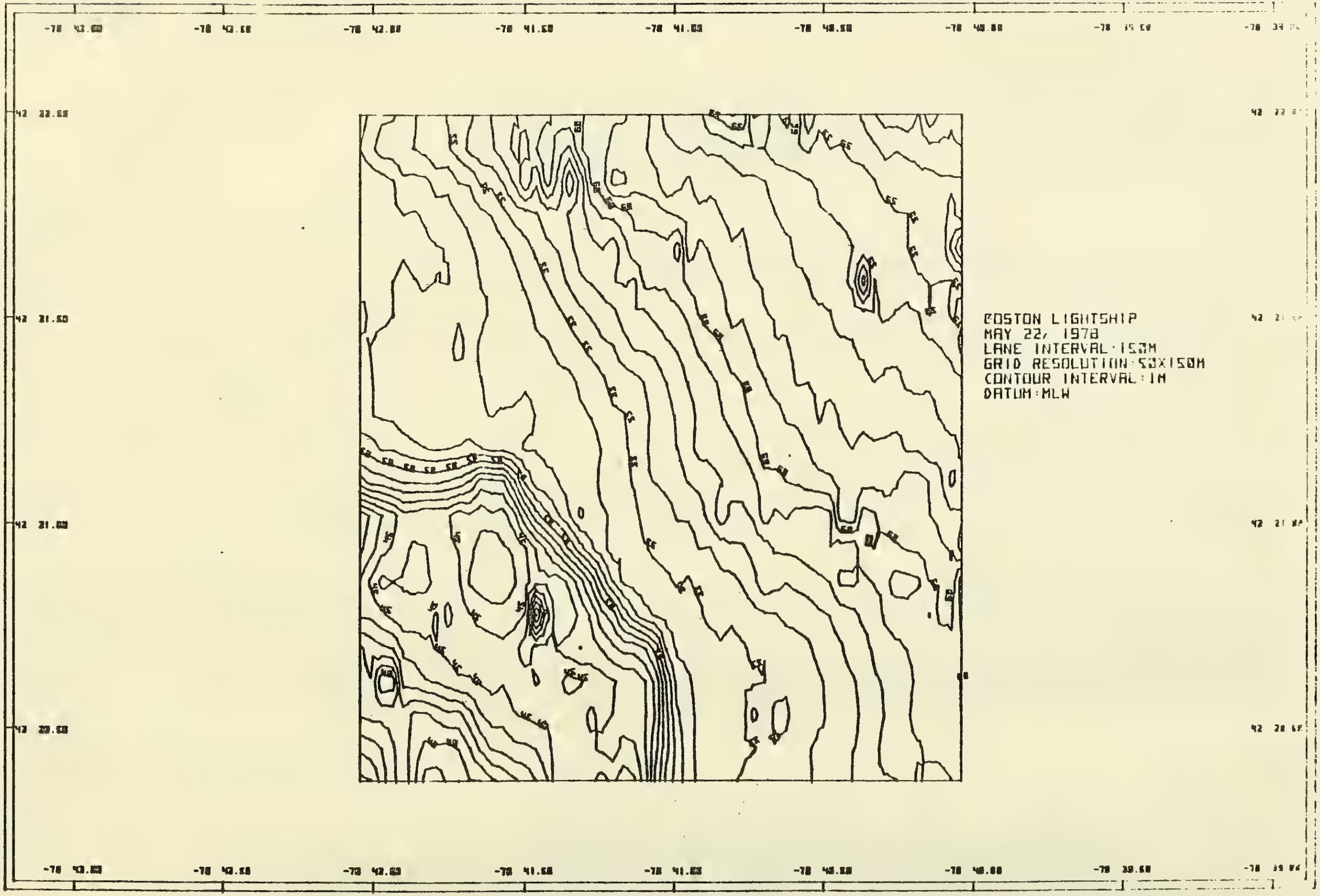

BOSTON LIGHTSHIP
DECEMBER 18, 1977
LANE INTERVAL - 150M
VERTICAL EXAGGERATION - 10X
-40
-50
-60
-70
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
X (M)
LANE 13
LANE 14
LANE 15
LANE 16

D. 5e

BOSTON LIGHTSHIP
DECEMBER 18, 1977
LANE INTERVAL - 150M
VERTICAL EXAGGERATION - 10X

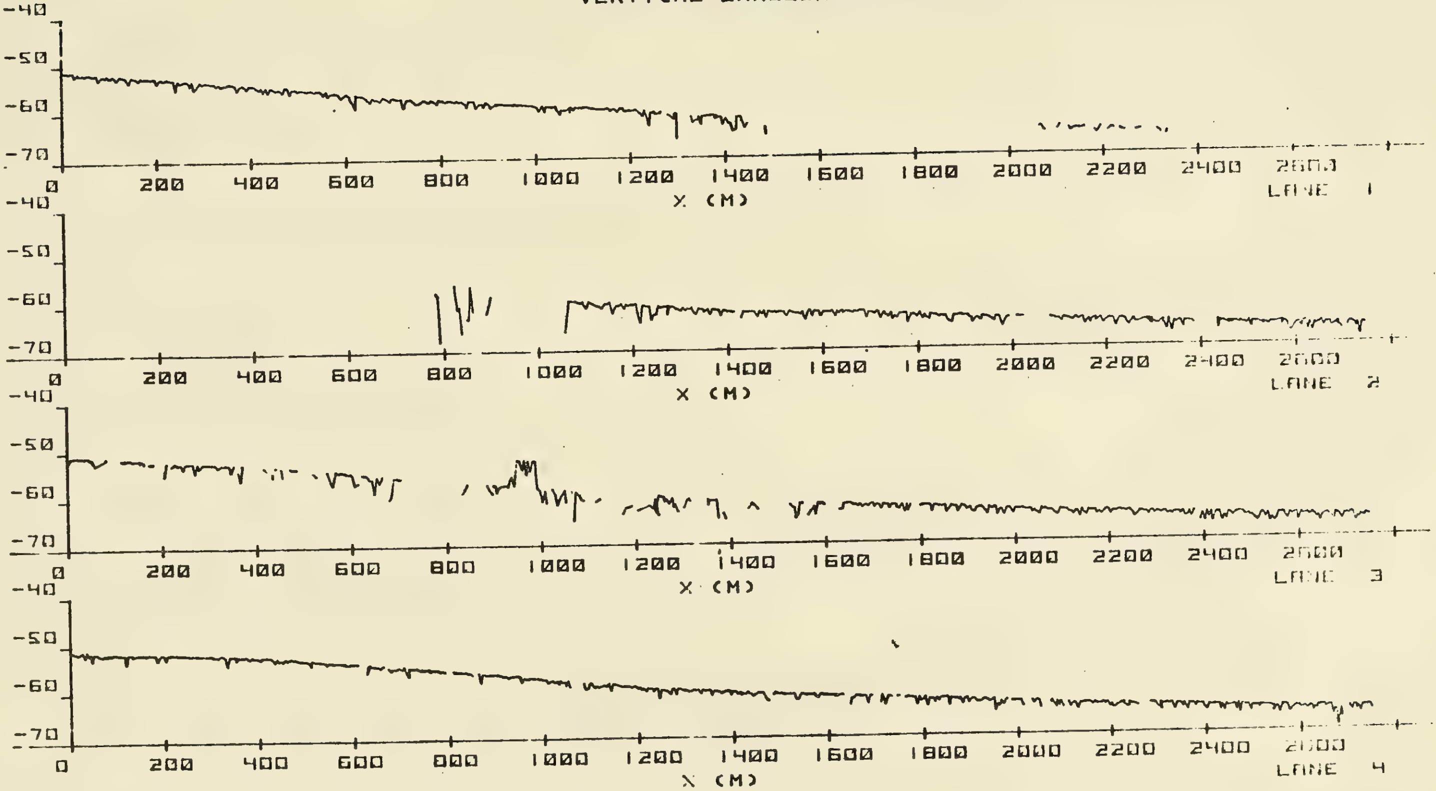


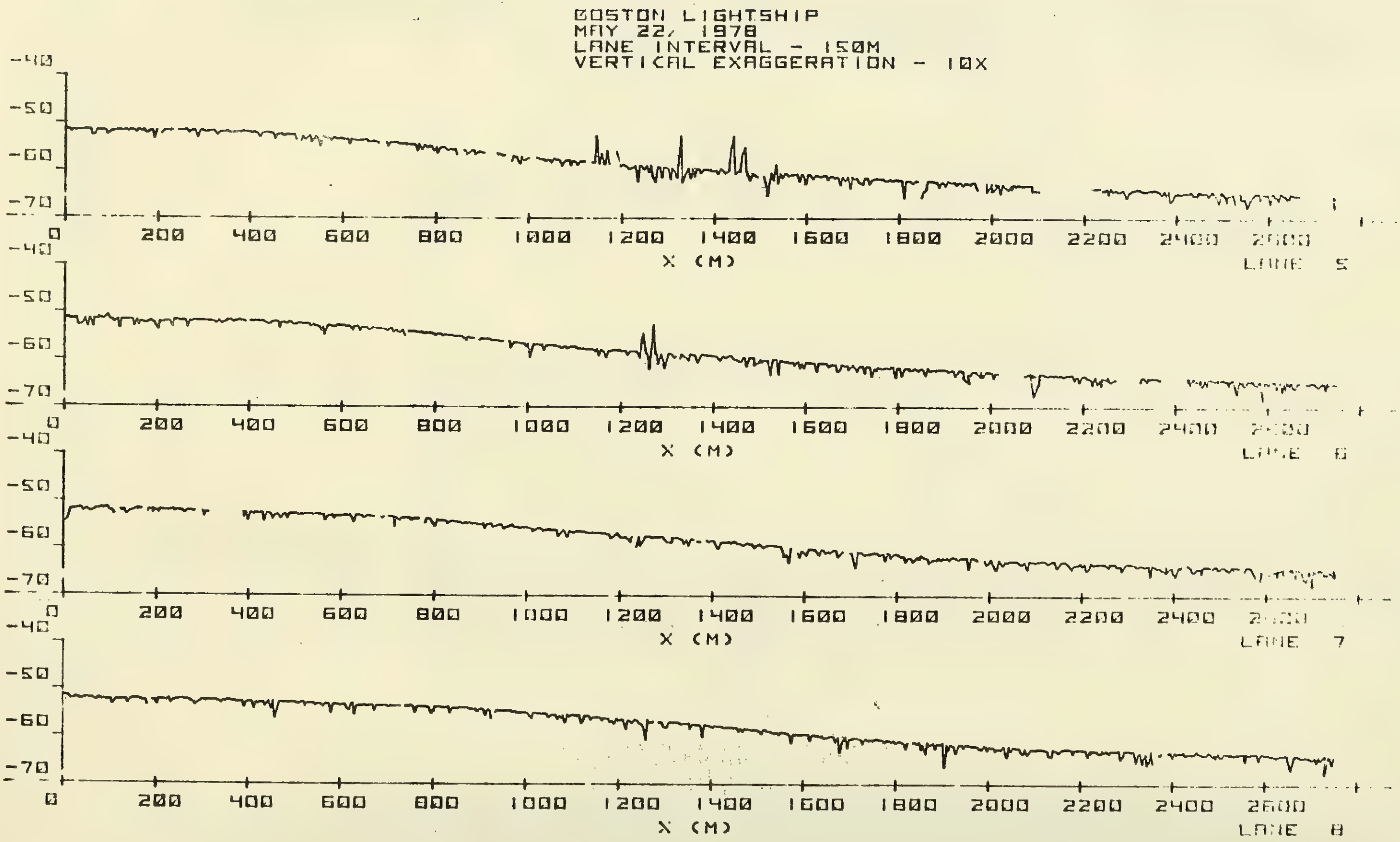

BOSTON LIGHTSHIP
DECEMBER 18, 1977
LANE INTERVAL - 150M
VERTICAL EXAGGERATION - 10X
-40
-50
-60
-70
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
X (M)
LANE 21



BOSTON LIGHTSHIP
MAY 22, 1978
LANE INTERVAL:150M
GRID RESOLUTION:50X150M
CONTOUR INTERVAL:1M
DATUM:MLW

BOSTON LIGHTSHIP
MAY 22, 1978
LANE INTERVAL - 150M
VERTICAL EXAGGERATION - 10X

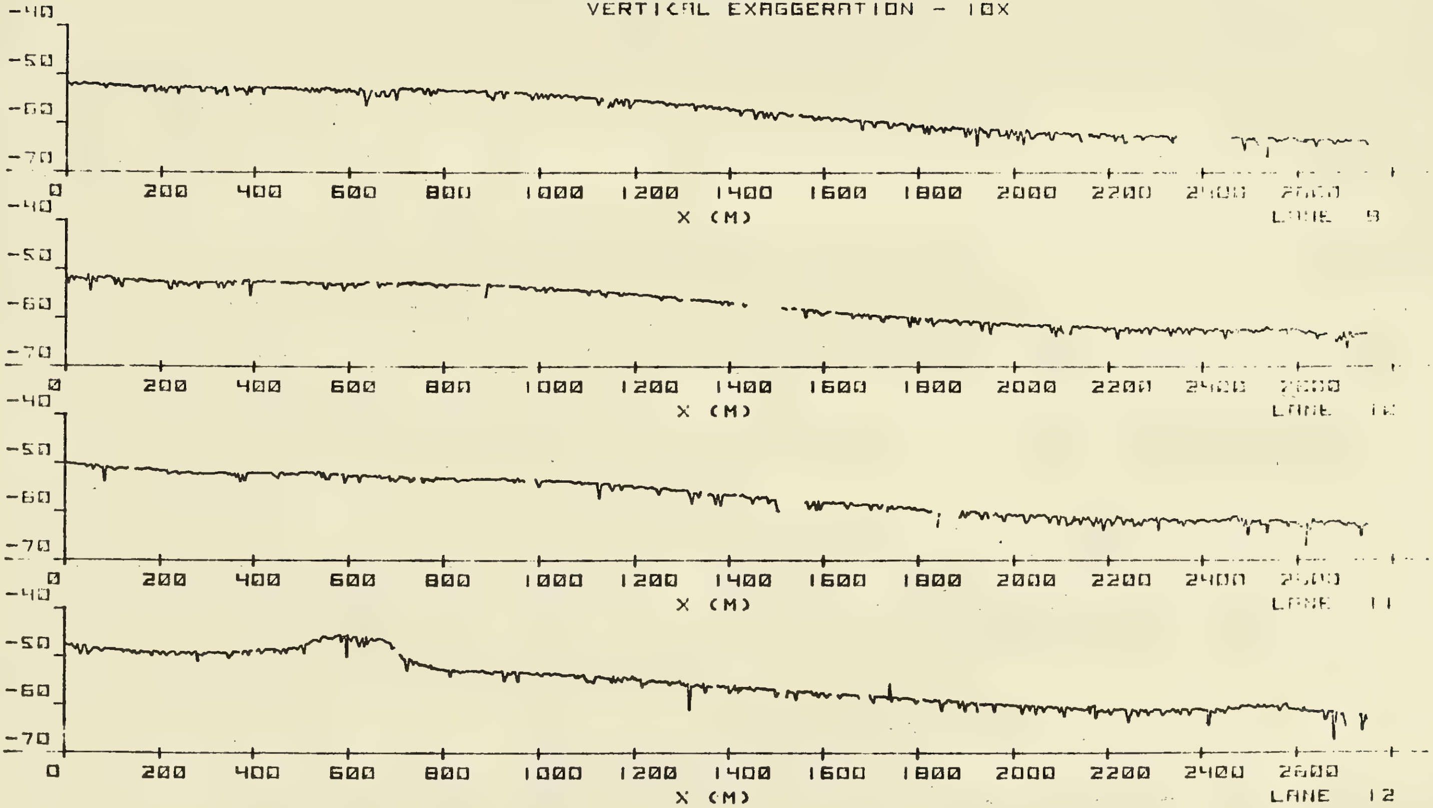




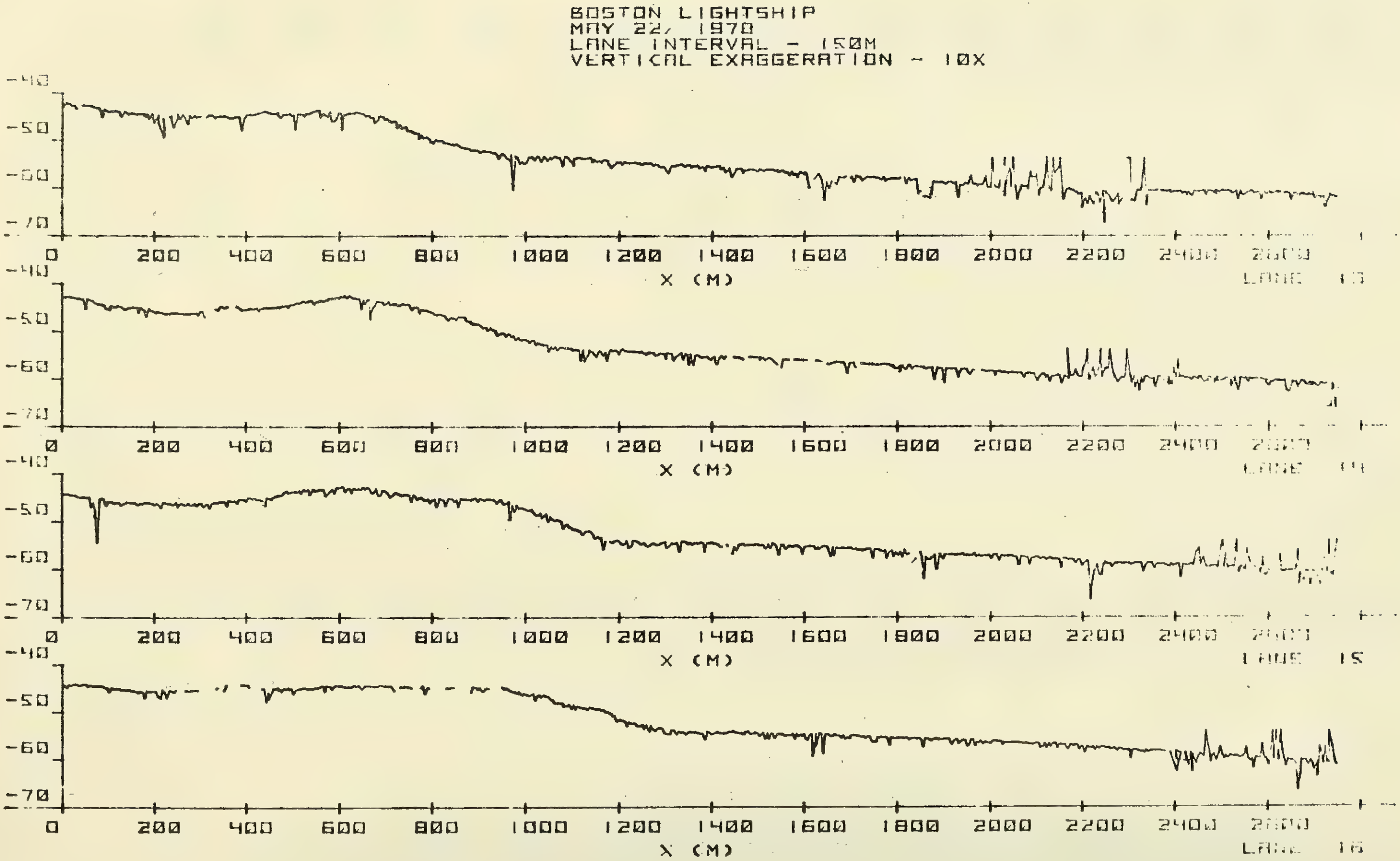
BOSTON LIGHTSHIP
MAY 22, 1978
LANE INTERVAL - 150M
VERTICAL EXAGGERATION - 10X

B-6c

BOSTON LIGHTSHIP
MAY 22, 1978
LANE INTERVAL - 150M
VERTICAL EXAGGERATION - 10X



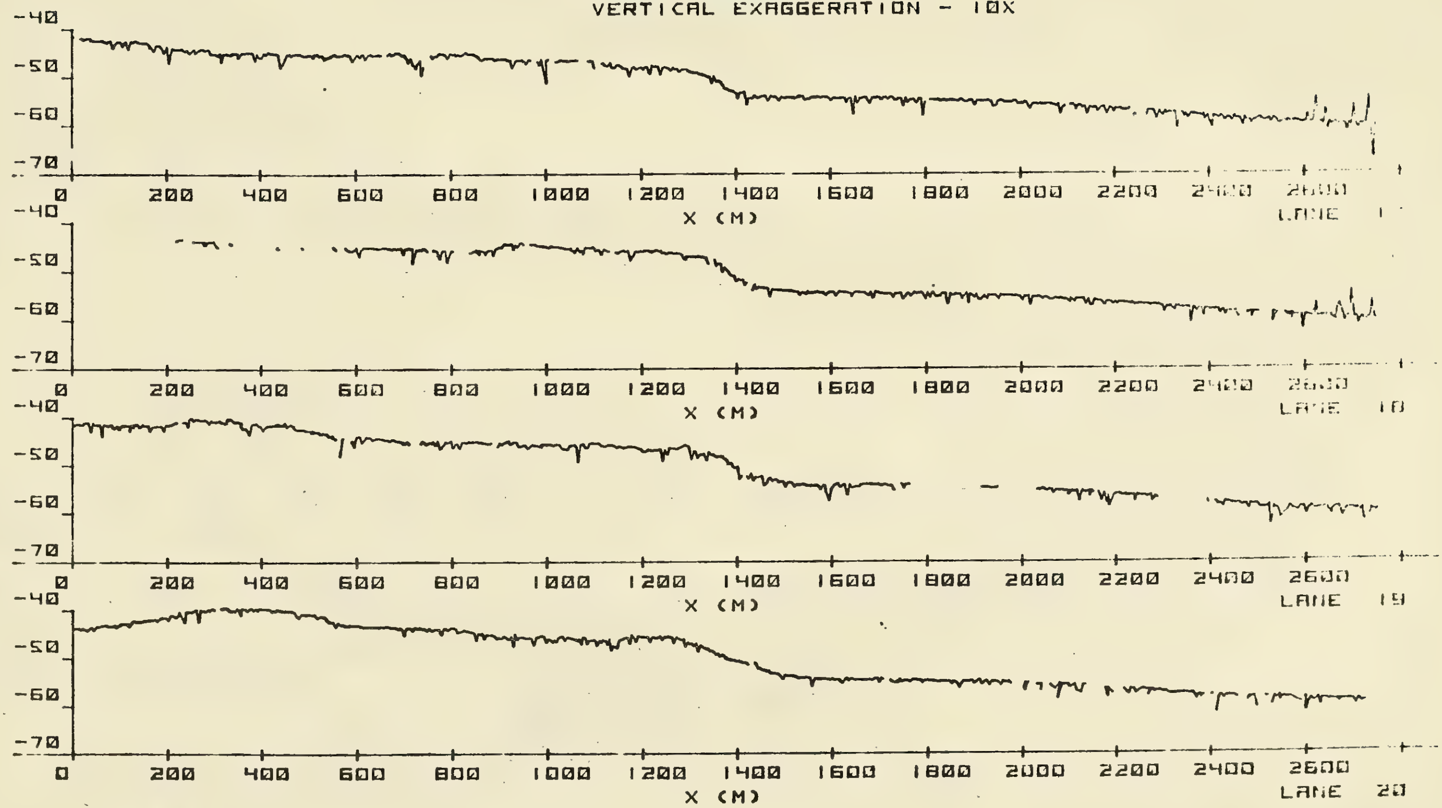
D- 6d



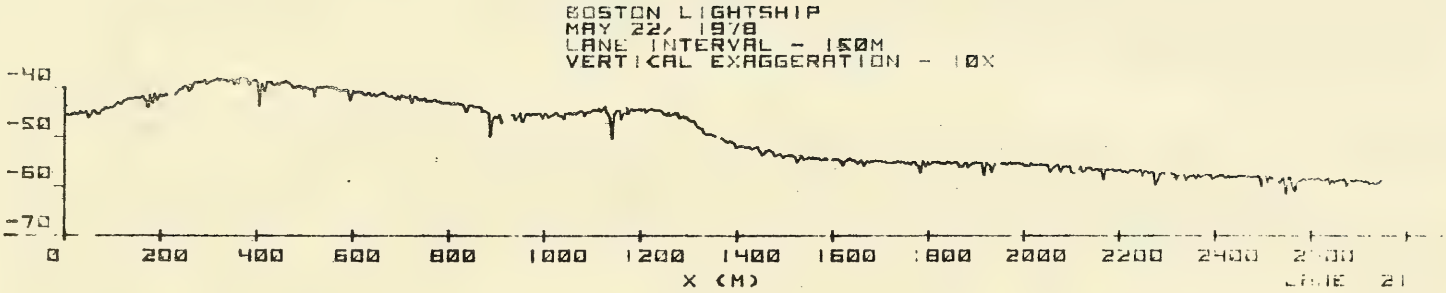
BOSTON LIGHTSHIP
MAY 22, 1970
LANE INTERVAL - 150M
VERTICAL EXAGGERATION - 10X

Fig. 6e

BOSTON LIGHTSHIP
MAY 22, 1978
LANE INTERVAL - 150M
VERTICAL EXAGGERATION - 10X



D-6f


BOSTON LIGHTSHIP
MAY 22, 1978
LANE INTERVAL - 150M
VERTICAL EXAGGERATION - 10X
-40
-50
-60
-70
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
X (M)
LINE 21

a 150 m grid spacing was used for these background surveys. Such a wide spacing increases the coverage, but greatly restricts the ability of the bathymetric system to define small features. The purpose of these surveys was to describe the major features of the disposal sites and define any specific locations where spoils might be present and detectable with acoustic methods.

On the Boston Foul Ground the only major features are Stellwagon Bank in the northeast corner of the site and a circular mound in the north central portion of the site. Sampling of this mound indicated it was composed of glacial material and is probably related to the same forces that created Stellwagon Bank. The remainder of the site is extremely flat, although a small depression exists near the center of the site. This depression contains fine black spoil material, probably from the Charles River Dam project, however, there is no topographic indication of spoil material.

At the Boston Lightship Dumping Ground a similar situation exists. The bottom in most of the surveyed area has a smooth, gentle slope to the northeast, and the only major feature in the disposal area is a bank rising toward Scituate, Mass. in the southwestern corner of the site. There are possible indications of spoil material in the vicinity of the disposal buoy that can be seen as spikes on transects 13 and 14 (Fig. D-6e) of the May survey. During the December survey, the weather was rough and problems were experienced utilizing the Bathymetric system for the first time under these conditions. Much of the northeast corner of the disposal site was lost due to bad data (Fig. D-5 (a-d)) and comparison of transects between surveys is probably not possible. The indications of spoil found in the May survey were not evident in December, consequently, further surveying is required to evaluate the viability of acoustic spoil detection. Sediment samples taken from the area confirm the presence of rocks, timbers and building materials at this location.

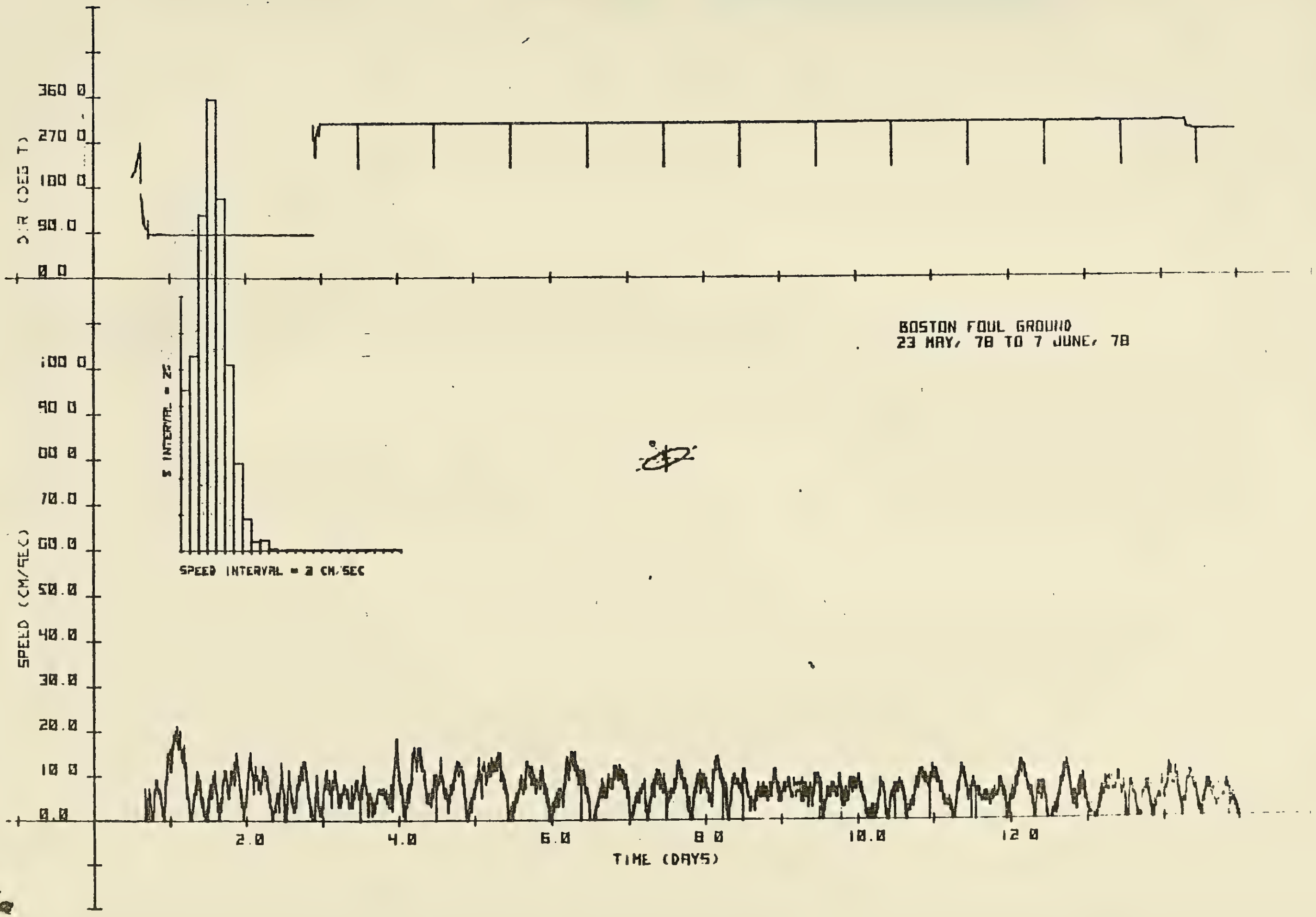
Future bathymetric surveying at these sites will be drastically reduced in areal coverage. Coordinations with the Corps of Engineers permits and contracting branches should allow point dumping at these sites and acoustic monitoring of future spoil disposal should be possible.

Currents

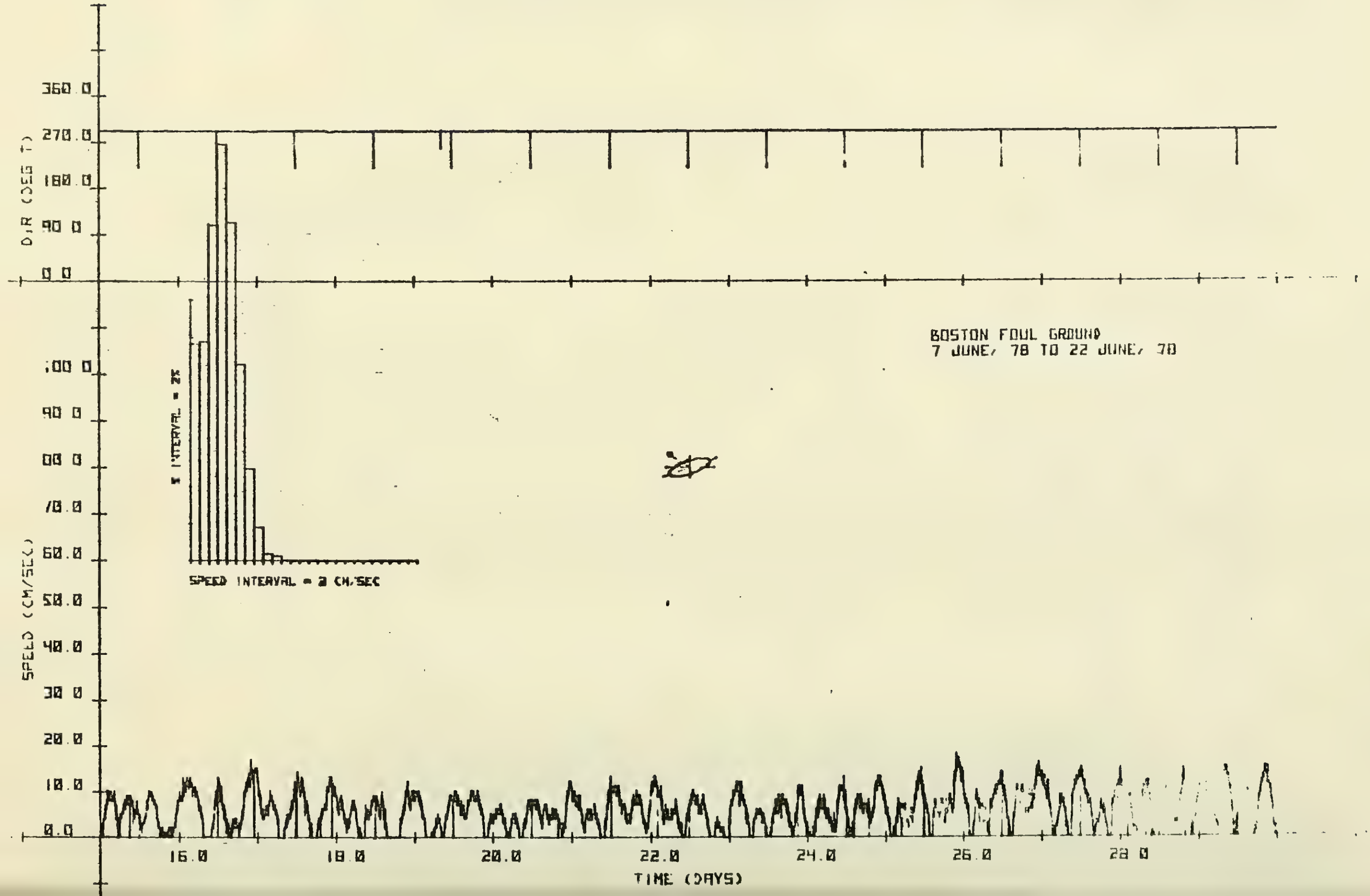
A current meter was installed at the Boston Foul Ground on May 23, 1978, that recorded data for forty-eight days until 10 July, 1978 (Fig.D-7(a-d)). Although speed information was obtained, the direction sensor was inoperable for the entire record. Consequently, the motion ellipses and other calculations for these data are not meaningful. The reliability of the speed may be doubtful as well since the direction problem may have resulted from fouling of the meter. The values of speed do look reasonable and consistant, however, and are presented in Table D-1 for general information.

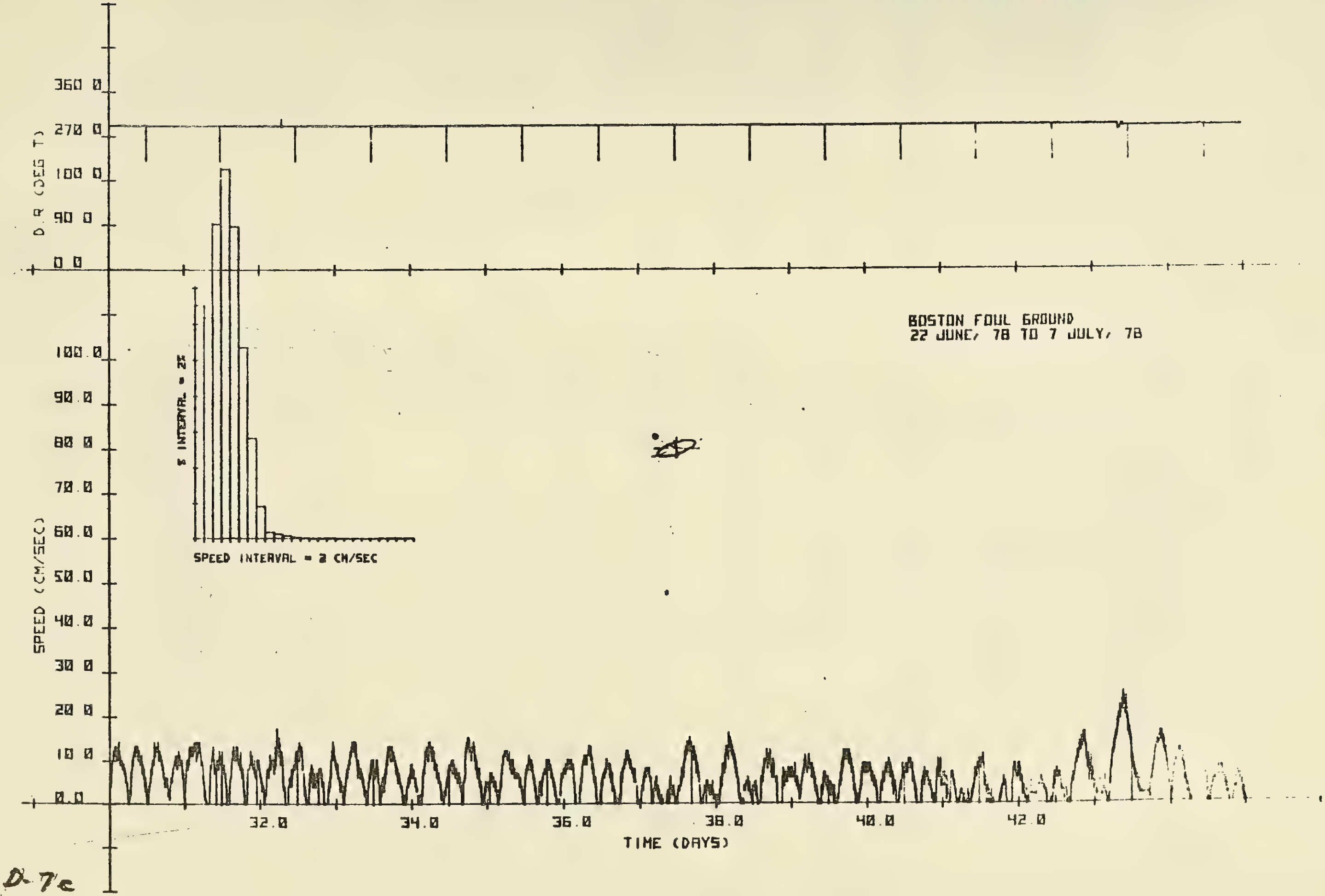
The value of 11.35 dynes/sec for horizontal kinetic energy at the Foul Ground is extremely low and indicative of a non-tidal flow area. The highest 10% speed of 14 cm/sec is also low and, if real, indicates that currents would not be sufficient to disperse spoils. Studies with the BOLT system would be important in this area to evaluate the effect of waves and swell on the bottom sediments.

No current meter has yet been placed at the Lightship disposal site.


BOSTON FOUL GROUND
23 MAY, 78 TO 7 JUNE, 78
DIR (DEG T)
360.0
270.0
180.0
90.0
0.0
SPEED (CM/SEC)
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
% INTERVAL = 25
SPEED INTERVAL = 2 CM/SEC
2.0
4.0
6.0
8.0
10.0
12.0
TIME (DAYS)

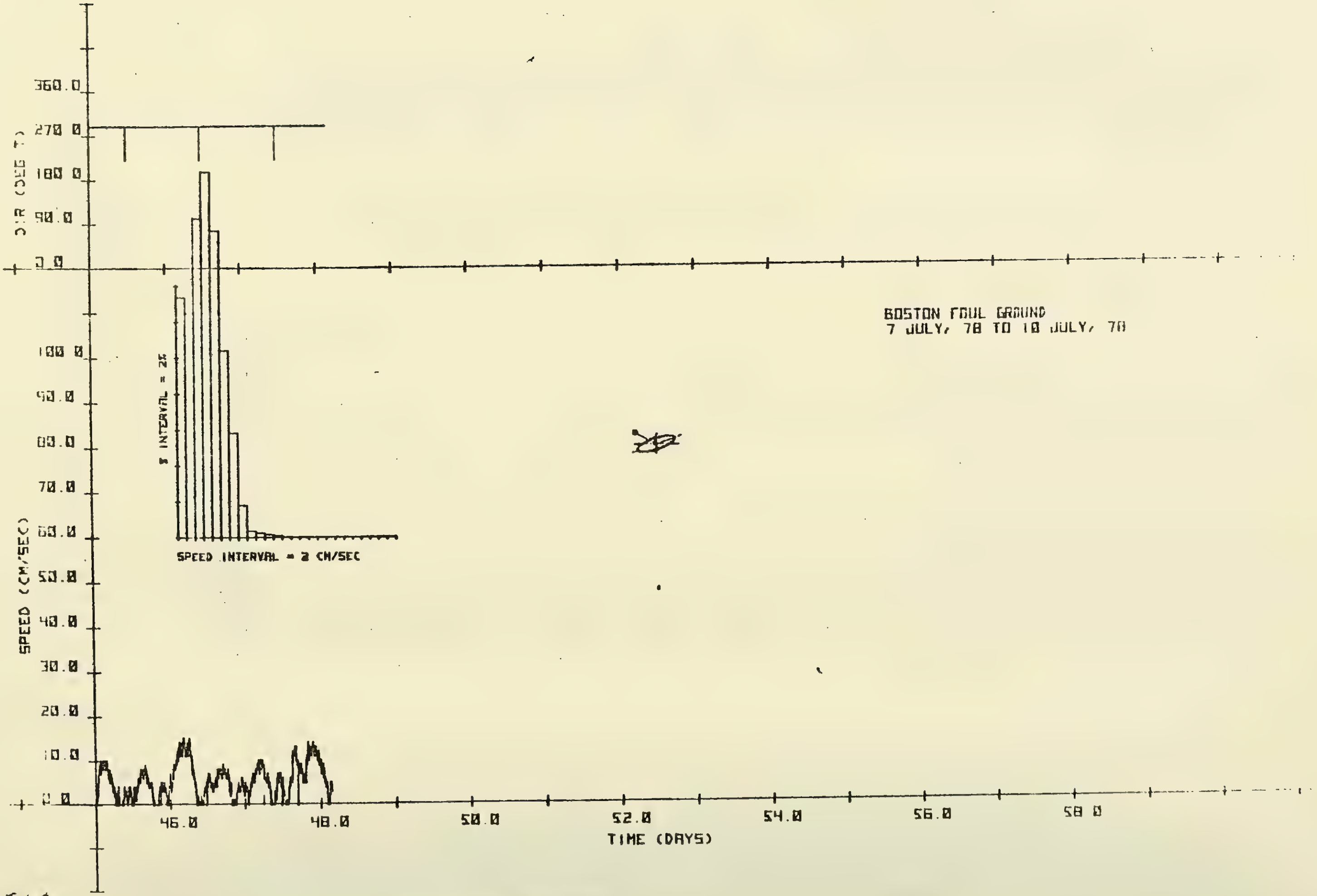
D 7a


BOSTON FOUL GROUND
7 JUNE, 78 TO 22 JUNE, 78
DIR (DEG T)
360.0
270.0
180.0
90.0
0.0
SPEED (CM/SEC)
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
% INTERVAL = 2%
SPEED INTERVAL = 2 CM/SEC
16.0
18.0
20.0
22.0
24.0
26.0
28.0
TIME (DAYS)



BOSTON FOUL GROUND
22 JUNE, 78 TO 7 JULY, 78

D-7c


BOSTON FOUL GROUND
7 JULY, 78 TO 10 JULY, 78

D-7d

TABLE D-1

	Total OBS. Current	Tidal Current Inc. Mean	Residual Current	Mean Current
Semi-major axis (cm/sec)	4.7 *	-	-	-
Semi-minor axis (cm/sec)	1.2 *	-	-	-
Direction (^{o}T)	072 *	N.A	N.A	-
Horizontal Kinetic energy (dynes/sec)	11.35 *	N.A	N.A	14.91 *
10% Highest speeds (cm/sec)	14.0 8.5%	-	-	-
Peak speed (cm/sec)	-	N.A	-	-
Average maximum speed (cm/sec)	-	N.A	-	-

*Direction Not Working

Sediment

Sediment samples were taken at both the Foul Ground and Lightship disposal sites for analysis of heavy metal content. The results of this analysis are presented in Table D-2. Samples were obtained in areas where disposal had occurred in the past and all samples are among the highest in metal concentration found in this study. All Boston samples have high metal enrichment relative

TABLE D-2

SURFACE SEDIMENT ANALYSIS

BOSTON MASS

SAMPLING	Cd	Co	Cr	Cu	Fe*	Hg	Ni	Pb	Zn	Vol/Sol (%)	Oil/Grease (ppm x 10^3)
				All metals ppm							
MAY 1978											
BRA 1	.39	11	87	17.2	2.4	.29	34	46	85	10.1	nil
BFA 3	.49	11	87	25.6	2.2	.19	33	58	100	16.2	nil
BLDS 1	.26	8.9	38	16.7	1.6	.049	21	18	48	3.0	1.1
BLDS 2	.54	11	69	46.3	1.9	.55	25	101	126	6.9	2.6

*All Fe values multiply by 10^4

TABLE D-2a

SAMPLE LOCATIONS

SITE: Boston Foul Ground

	DISPOSAL SITE:				REFERENCE SITE		
DATE	CURRENT METER	MUSSELS	BENTHIC SAMPLES DREDGES	BENTHIC SAMPLES GRABS	MUSSELS	BENTHIC SAMPLES DREDGES	BENTHIC SAMPLES GRABS
18/Dec/1977			42°25'21.8" 70°34'54.2"				
23/May/1978	42°25'41.9" 70°34'51.8"	42°25'45.2" 70°34'50.1"	42°25'39.9" 70°34'38.0"				
21,22/May/78					42°30'07" + 70°46'28"		
6/Dec/1978							

Same Ref. For Boston Lightship

P-2c

Boston Foul Ground

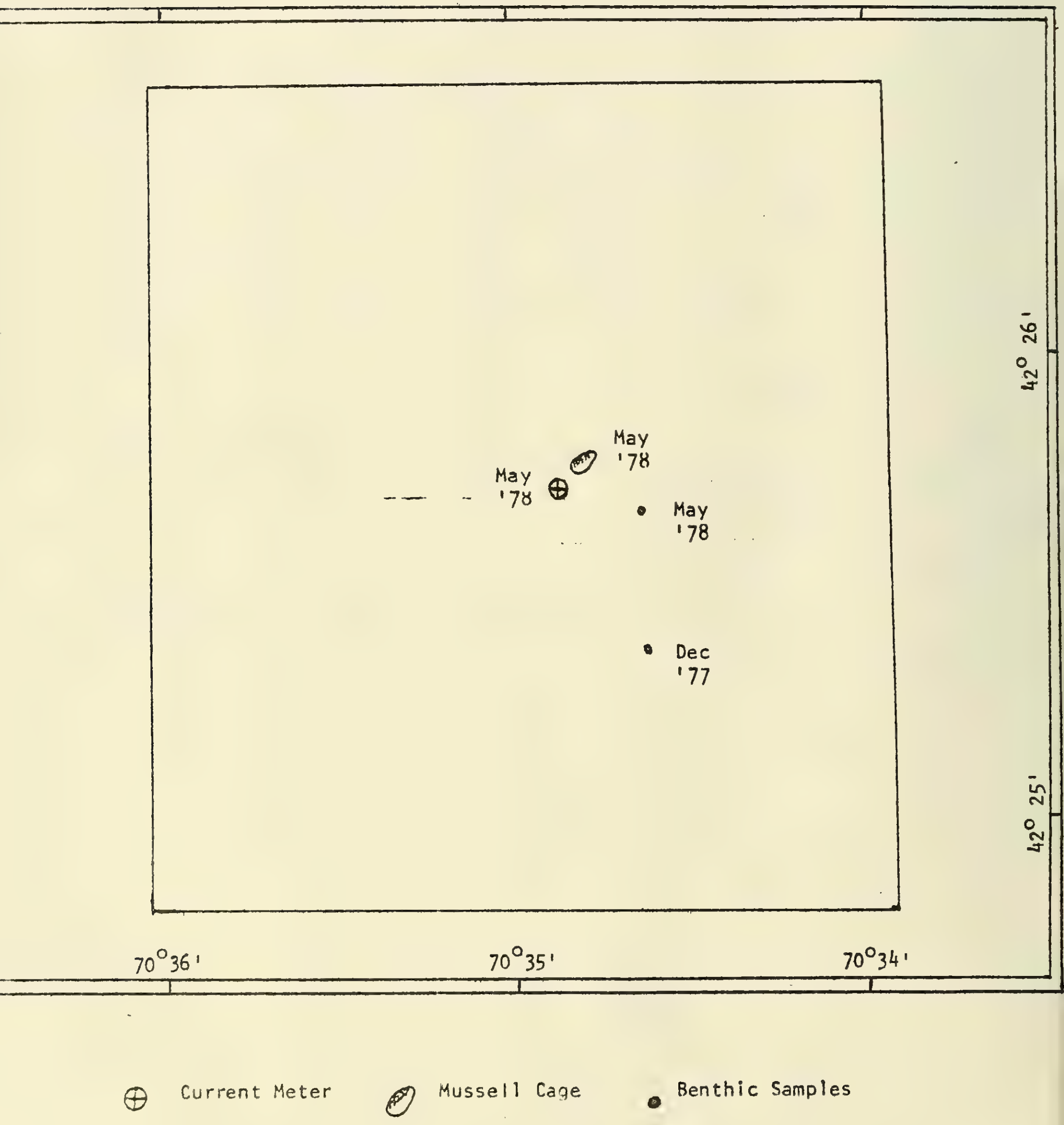


TABLE D-2b

SAMPLE LOCATIONS

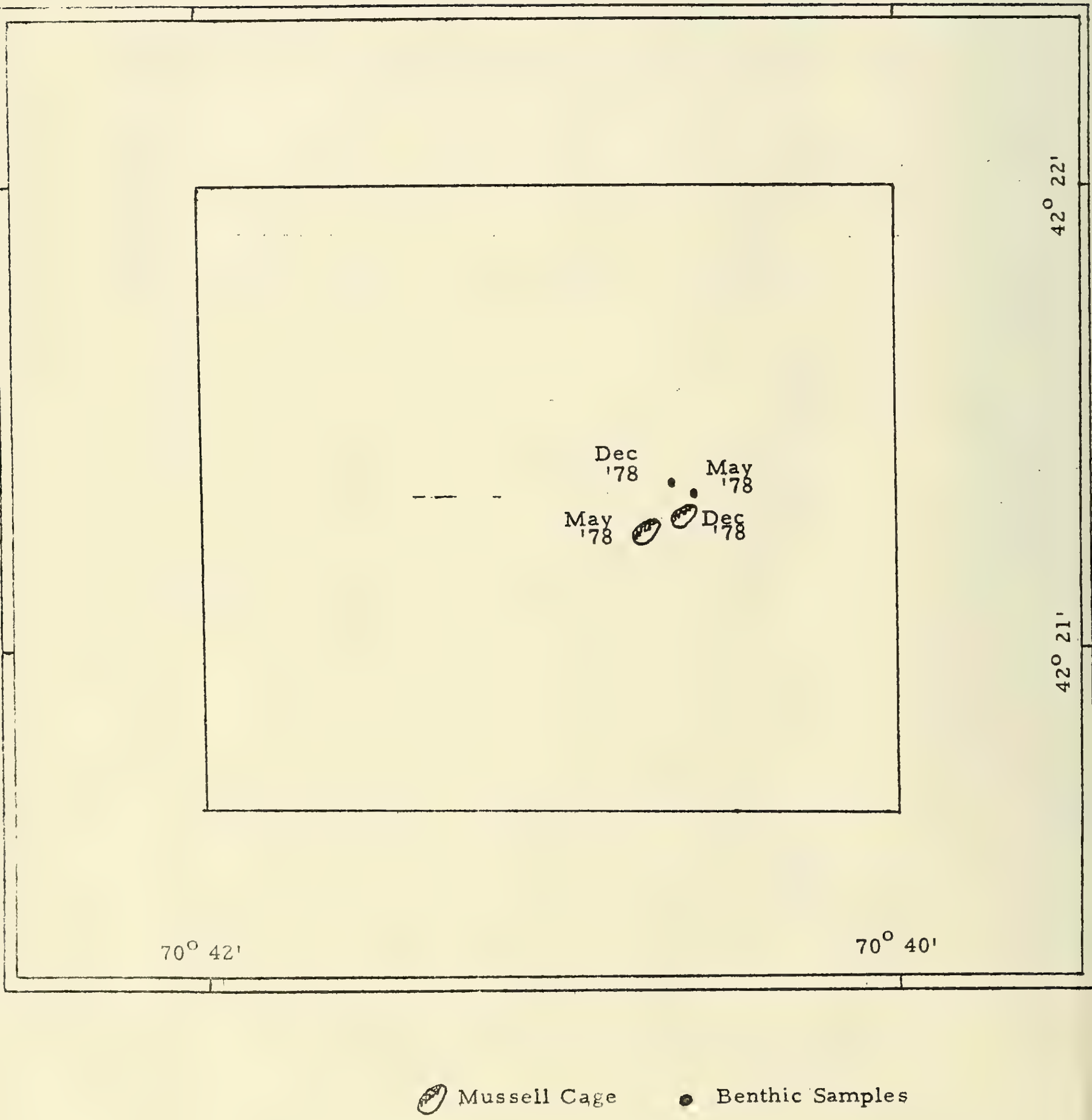
SITE: Boston Lightship

DATE	DISPOSAL SITE: CURRENT METER	DISPOSAL SITE: MUSSELS	DISPOSAL SITE: BENTHIC SAMPLES DREDGES	DISPOSAL SITE: BENTHIC SAMPLES GRABS	REFERENCE SITE MUSSELS	REFERENCE SITE BENTHIC SAMPLES DREDGES	REFERENCE SITE BENTHIC SAMPLES GRABS
22/May/1978					42°30'07" + 70°46'28"		
23/May/1978		42°21'17.0" 70°40'43.6"	42°21'19.2" 70°40'37.2"				
6/Dec/1978		42°21'17.6" 70°40'36.2"	42°21'20.8" 70°40'37.9"				
18/Dec/1977							

Same Ref. For Boston Foul

D-2d

Boston Lightship



to iron and therefore, have characteristics similar to western Long Island Sound Sites rather than northern New England areas. Unless cleaner areas can be defined within these disposal sites, differentiation of new spoils on the basis of chemical characteristics is doubtful.

Biochemical Studies

Reference samples of M. modiolus from Halfway Rock, northeast of Marblehead, Mass. were placed on the Boston Foul Ground and Lightship disposal sites in May, 1978. Although information was obtained from the Foul Ground mussels in August '78 the release mechanism on the mooring at the Lightship failed and no samples were obtained. Data from the reference station at Halfway Rock and the August '78 Foul Ground sample are presented in Table D-3 and Figure D-8. Chromium at the reference station mussels was the only metal to show a significant concentration increase during the monitoring period. However, significant decreases in Cu at the reference and disposal site and Pb at the disposal site occur in August, 1978.

It should be noted that the August, 1978 samples have concentrations of Cd, Cr, Cu, Hg and Zn from the Boston Foul Ground that are consistantly lower than concentrations from the Halfway Rock reference samples. Such differences may have resulted from pollution by land based sources at Halfway Rock, which is located close to shore. Such a conclusion would mean that the effect of dredge spoils, which the sediment samples have shown to be rich in heavy metals, is minimal with regard to dissolved or suspended metals that may be ingested by the mussels. Obviously, more temporal and spatial data are needed before a definative statement can be made.

Table D-3. Heavy Metal Concentrations (ppm) in *Modiolus modiolus* from Halfway Rock deployed at Boston Foul Ground Disposal site (Northern New England).

Date	Location		Cd	Cr	Cu	Hg	Pb	Zn	Fe
8-21-77	Halfway Rock	$\bar{x}$	10.78	2.82	50.51	0.274	23.39	317	166
		S.D.	1.78	0.49	6.96	0.047	5.76	97	77
5-21-78		$\bar{x}$	8.77	5.22	41.17	0.218	11.81	332	147
		S.D.	3.31	0.88	10.31	0.025	1.11	91	5
8-8-78		$\bar{x}$	9.13	2.72	31.98	0.315	15.77	310	88
		S.D.	1.13	0.09	1.32	0.078	3.01	72	2
8-22-78	Boston Foul Ground	$\bar{x}$	6.63	2.07	23.21	0.280	6.52	232	122
		S.D.	0.19	0.57	0.61	0.035	1.12	7	9

Benthic Macrofauna

The population statistics of the major species from the Boston Foul Ground and Lightship are presented in Tables D-4 and D-5. Both disposal sites have similar population characteristics, although the Foul Ground appears to have more diversity but lower total number of individuals than does the Lightship disposal site.

Fisheries

Initial interviews with draggermen and lobstermen from the north and south shores have indicated that fisheries resources are abundant in Massachusetts Bay. Since this area is near many fishing ports, there is considerable competition to fish near the disposal sites dispite inherent disadvantages.

It is the authority of the Food and Drug Administration to close areas outside of state waters to shellfishing if the possibility of contamination exists. In New England, closures are made by the Northeast Technical Services Unit (FDA) Davisville, R.I. The foul ground is unique in New England in that both shellfishing and groundfishing are prohibited in the radius of 1 mile around the site center.

Finfish. There is a tendency for draggers from different ports to fish specific grounds. Northshore vessels fish north of the foul ground and along the edges of Stellwagon (Middle) Bank. Vessels from Scituate fish east and southeast of the Boston Light dumping ground. Boats from Boston and Weymouth, as well as those from the other areas, fish shoreward of the Boston Light ground.

The approximate location of dragging grounds in the study area are shown in Fig. D-9. The shaded areas are fished throughout the year. Cod are caught from January to February or until dogfish sharks appear in the summer. Dab and

TABLE D-4

DAMOS BENTHOS - TABLE OF NUMERIC DENSITY DATA

STATION: BOSTON FOUL GROUND

DATE: 18 DECEMBER 1977

	PREDOMINANT SPECIES	DREDGE NUMBER										
		#1	#2	#3	TOTAL	MEAN	STANDARD DEVIATION	COEFF. OF DISPERSION	95 PERCENT CONF. LIMITS OF MEAN	NUMERIC RANK	% OF TOTAL	CUMUL. % OF TOTAL
1.	Ninoe nigrippes	7	11	8	26	8.7	2.1	0.5	3.5-13.9	1	14.5	14.5
2.	Sternaspis scutata	0	8	15	23	7.7	7.5	7.3	0-26.3	2	12.8	27.3
3.	Praxillella gracilis	0	7	7	14	4.7	4.0	3.4	0-14.6	3	7.8	35.1
4.	Molpadia oolitica	0	5	6	11	3.7	3.2	2.8	0-11.7	4	6.1	41.2
5.	Lumbrineris tenuis	1	7	2	10	3.3	3.2	3.2	0-11.3	5	5.6	46.8
6.	Myriodule heeri	0	5	4	9	3.0	2.6	2.3	0- 9.5	6	5.0	51.8
7.	Yoldia lucida	0	7	2	9	3.0	3.6	4.3	0-11.9	6	5.0	56.8
8.	Scoloplos acutus	0	6	2	8	2.7	3.1	3.6	0-10.4	7	4.5	61.3
9.	Micrura sp.	0	5	2	7	2.3	2.5	2.7	0- 8.5	8	3.9	65.2
10.	Ctenodiscus crispatus	1	5	0	6	2.0	2.6	3.4	0- 8.5	9	3.4	68.6
11.	Goniada maculata	2	3	0	5	1.7	1.5	1.3	0- 5.4	10	2.8	71.4
12.	Nucula tenuis	0	2	2	4	1.3	1.2	1.1	0- 4.3	11	2.2	73.6
13.	Spio Filicornis	1	2	1	4	1.3	0.6	0.3	0- 2.8	11	2.2	75.8
14.	Yoldia thraciaeformis	0	2	2	4	1.3	1.2	1.1	0- 4.3	11	2.2	78.0
15.	Nephthys incisa	1	2	0	3	1.0	1.0	1.0	0- 3.5	12	1.7	79.7
16.	Ophiura sarsi	0	0	3	3	1.0	1.7	2.9	0- 5.2	12	1.7	81.4
	TOTAL	13	77	56	146	48.7	32.6	21.9	0-129.7			
	TOTAL NO. OF SPP PER DREDGE	9	31	20	39	20.0	11.0		0- 47.3			
	SPECIES DIVERSITY (H')	1.87	3.12	2.59	7.58	2.53	0.63					
	EQUITABILITY (J')	0.85	0.91	0.87	2.63	0.88	0.03					

TOTAL NO. OF INDIVIDUALS THIS STATION = 179

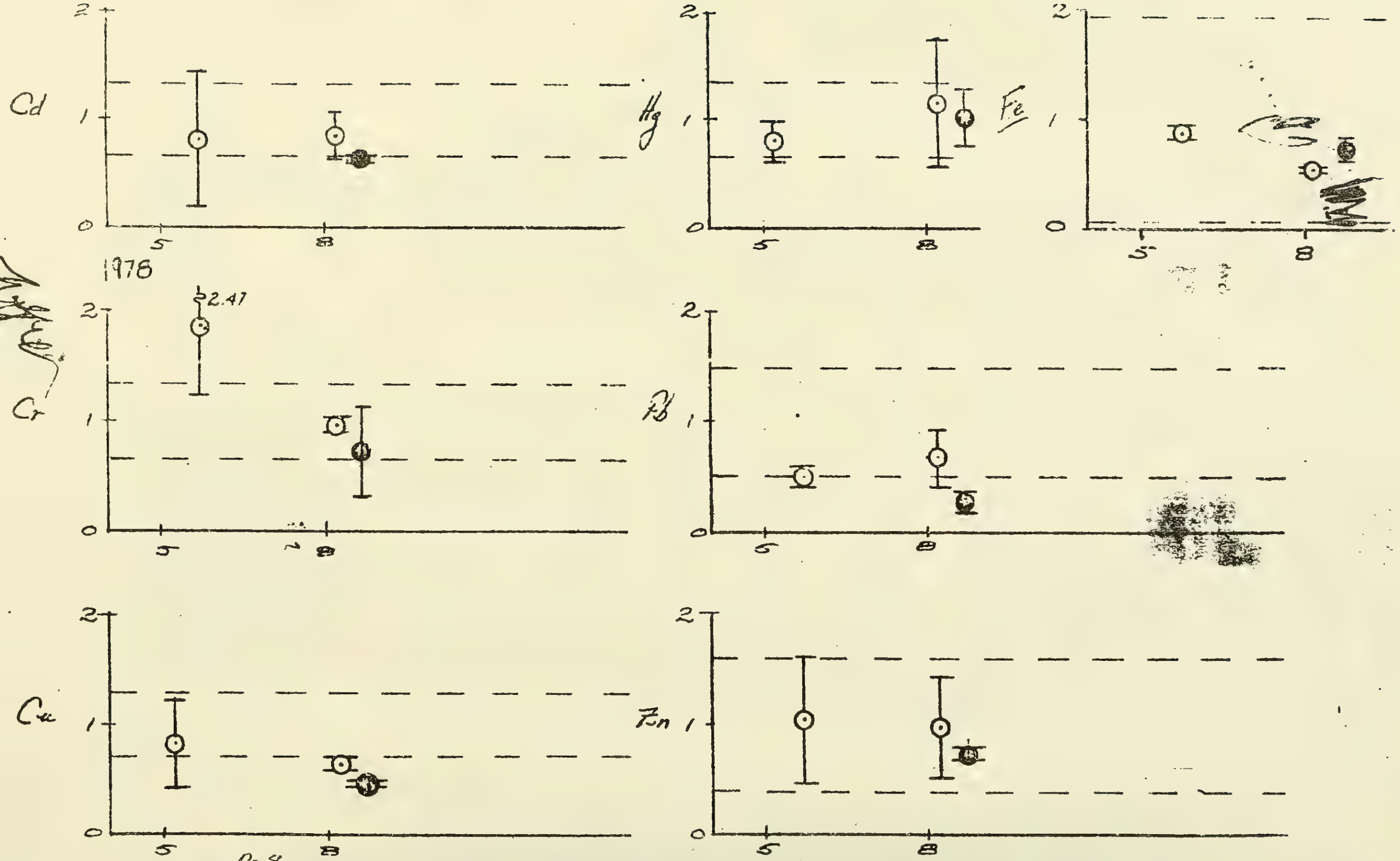
TABLE D-5

DAMOS BENTHOS - TABLE OF NUMERIC DENSITY DATA

STATION: BOSTON LIGHTSHIP DATE: 18 DECEMBER 1977

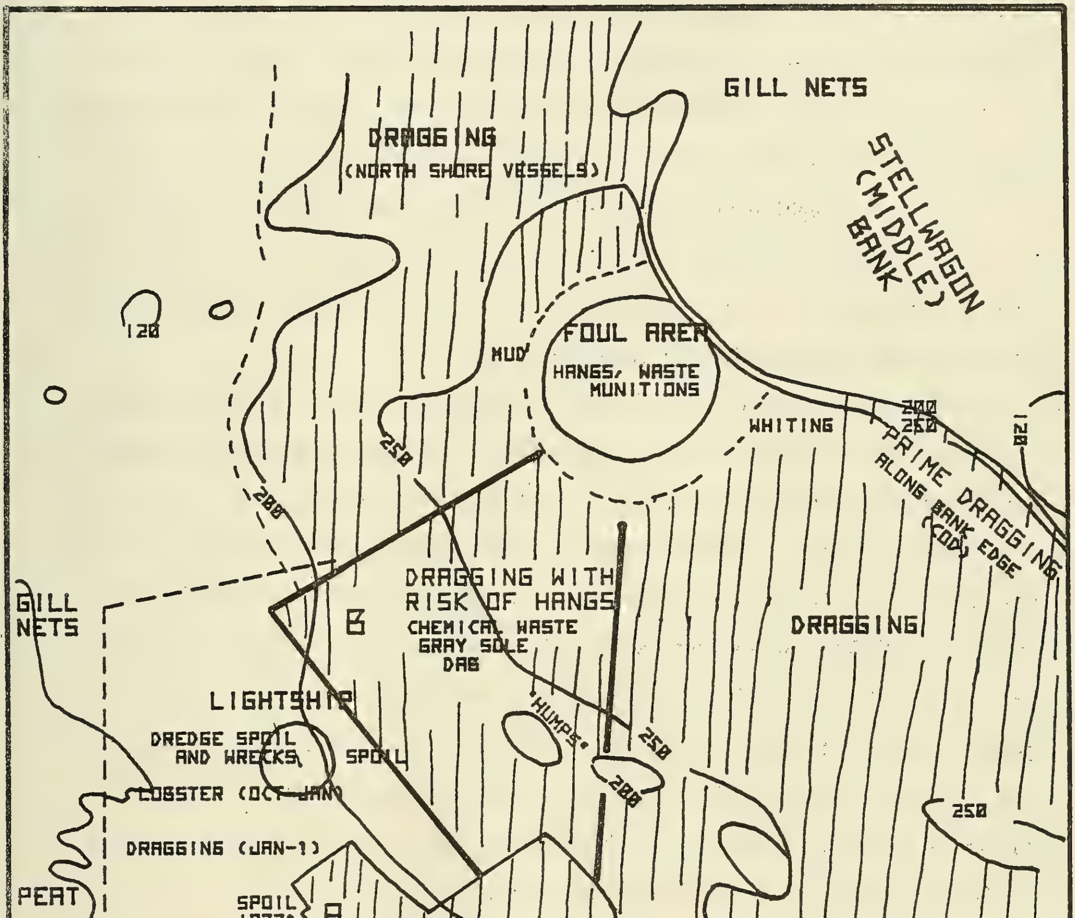
	PREDOMINANT SPECIES	DREDGE NUMBER #1	#2	#3	TOTAL	MEAN	STANDARD DEVIATION	COEFF. OF DISPERSION	95 PERCENT CONF. LIMITS OF MEAN	NUMERIC RANK	% OF TOTAL	CUMUL. % OF TOTAL
1.	Sternaspis scutata	47	32	0	79	26.3	24.0	21.9	0-85.9	1	30.6	30.6
2.	Nephthys incisa	14	20	0	34	11.3	10.3	9.4	0-36.9	2	13.2	43.8
3.	Micrura sp.	5	11	0	16	5.3	5.5	5.7	0-19.0	3	6.2	50.0
4.	Maldame sarsi	6	8	1	15	5.0	3.6	2.6	0-13.9	4	5.8	55.8
5.	Lumbrineris fragilis	7	6	0	13	4.3	3.8	3.4	0-13.7	5	5.0	60.8
6.	Ninoe nigrippes	10	3	0	13	4.3	5.1	6.0	0-17.0	5	5.0	65.8
7.	Goniada maculata	2	5	5	12	4.0	1.7	0.7	0- 8.2	6	4.7	70.5
8.	Edwardsia (elegans)	1	7	0	8	2.7	3.8	5.3	0-12.1	7	3.1	73.6
9.	Ampharete acutifrons	3	1	1	5	1.7	1.2	0.8	0- 4.7	8	1.9	75.5
10.	Hippomedon serratus	4	1	0	5	1.7	2.1	2.6	0- 6.9	8	1.9	77.4
	TOTAL	99	94	7	200	66.7	51.7	40.1	0-195.1			
	TOTAL NO. OF SPP. PER DREDGE	31	29	9	47	23.0	12.2		0- 53.3			
	SPECIES DIVERSITY (H')	2.52	2.61	1.95	7.08	2.36	0.36					
	EQUITABILITY (J')	0.73	0.77	0.89	2.39	0.80	0.08					

TOTAL NO. OF INDIVIDUALS THIS STATION = 258



D-8

Figure [illegible]. Temporal variation in the ratios of heavy metals in Modiolus modiolus from Halfway Rock (O) deployed at Boston Foul Ground disposal site (●). Broken lines depict the 95% confidence limits of the baseline data.



FISHERIES IN THE VICINITY OF
MASSACHUSETTS BAY DISPOSAL SITES

FIG D-9

gray sole are caught in the spring and summer. High prices for gray sole make it worthwhile to fish for small quantities immediately east of the Lightship dumping buoy. Yellowtail flounder are caught at the edge of shoaling bottom to the south in January and March. Some cod are caught inshore of the Lightship Grounds but details of this fishery have not been determined yet.

Whiting is caught west of Stellwagon Bank from June to October and Atlantic herring are caught on or near the bank during their October spawning period. Both of these species swim off the bottom and are less affected by bottom conditions than the demersal species mentioned above.

Gill nets are fished in winter and spring for cod on the northern extension of Stellwagon Bank, on hard bottom 2 miles N.NW of the Boston Light dumping ground, and south of the ground in less than 40 meter depths.

A disadvantage of fishing in the vicinity of the dumping grounds is the possibility of catching waste materials. A number of concrete "coffins" containing radioactive waste have been caught south of the foul ground. Containers of foul smelling chemicals have also been caught here. Around the Boston Light ground, parts of the bottom have been systematically swept clear of timbers by the draggers. Large masses of saltmarsh peat have been a problem in the past, but these appear to be broken up after several years. Fishermen have observed the greater accuracy of recent disposal projects.

Lobster. Approximately 10 relatively large lobster boats from both the north and the south shores fish the dumping ground. Lobsters migrating into deeper water reach this area in October or November. Recently, lobstering at the dumping ground has been ended in January by the incursion of draggers. A test made in the summer showed that lobsters were absent at this time. A relatively large number of "culls" are caught in the dumping ground.

A lobsterman who has fished this area for many years reported that from about 1966 to 1974 there was no dragging in the dumping ground due to debris on the bottom and a lack of local knowledge. In the last four years, draggers with heavy gear and rollers have found the area fishable.

Other Fisheries. Before stocks declined regionally, northern shrimp were caught in deeper muddy bottomed areas near the disposal sites in the winter. It is the opinion of some draggermen that this fishery was extremely destructive to populations of young finfish.

Ocean quahogs were sampled at 5 stations within the southern half of the Boston Light dumping ground by Riser and Jankowski (1974). It is unlikely that a quahog fishery would develop close to the disposal site since stocks are found closer to shore and there are possibilities of littering waste materials on the bottom or of fishing in contaminated sediments.